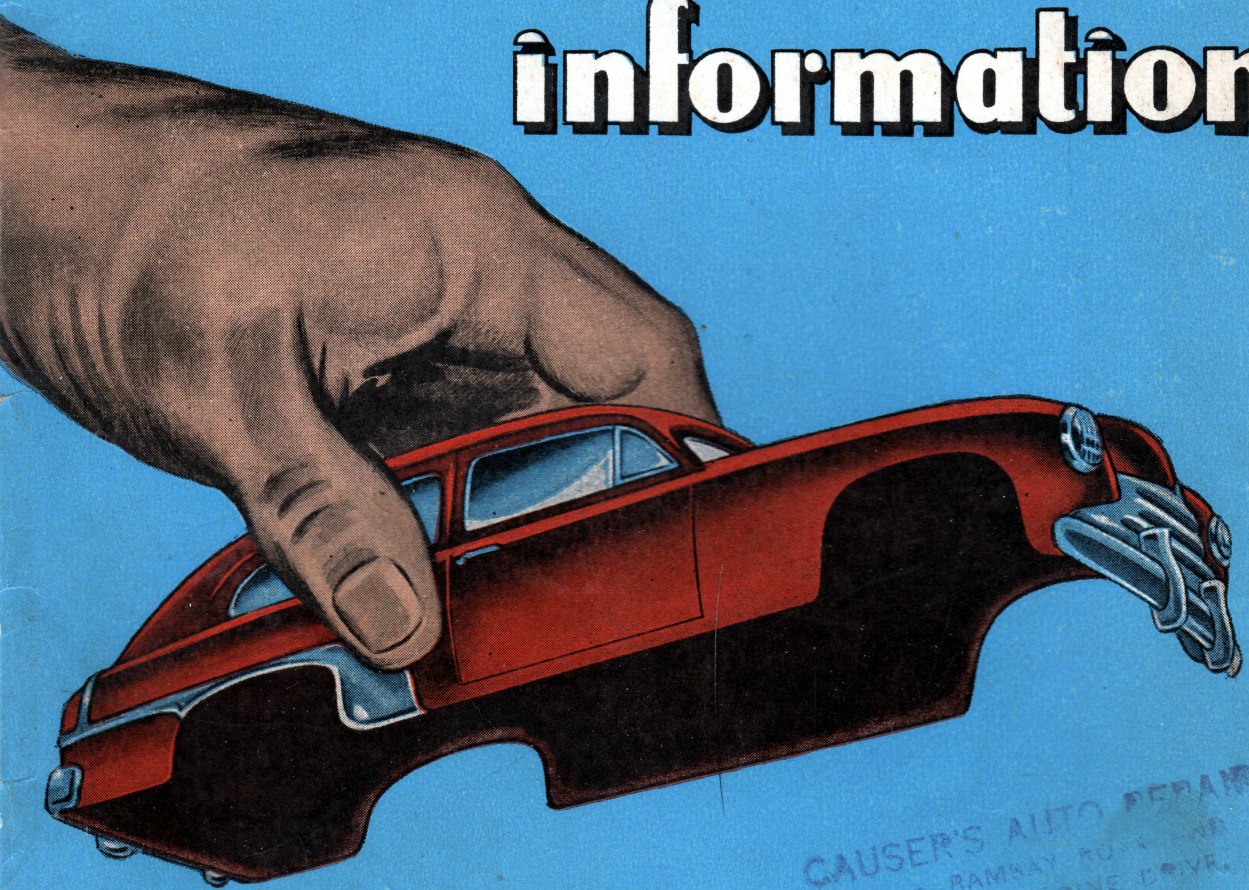
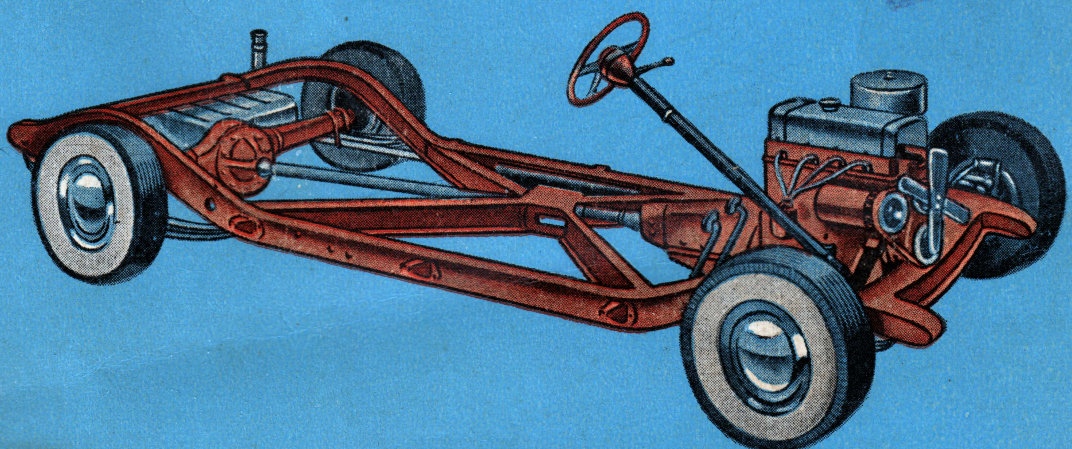
Inside information





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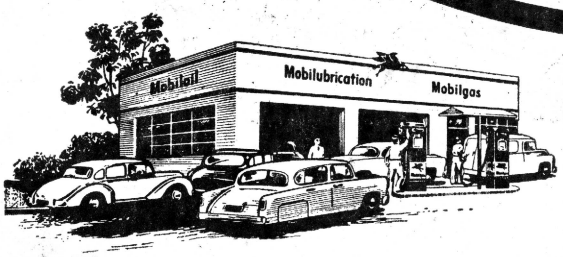

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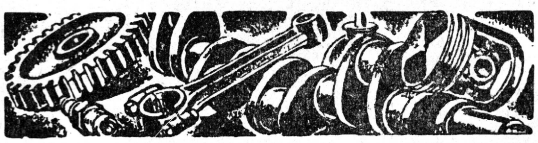
Inside Information about your Car

The purpose of this booklet is to provide car owners with a better understanding of their cars.

We have tried to present the subject in an interesting and easily understood manner, for we believe that a clear grasp of the principles of operation is of considerable help in obtaining maximum efficiency and economy from your car.

It is our earnest hope that this booklet will help you to achieve more economical and enjoyable motoring.



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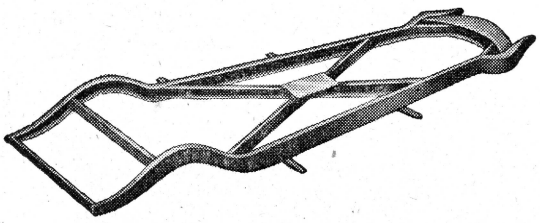
7TH EDITION 50855

The Inside Story of Your Car is Simple

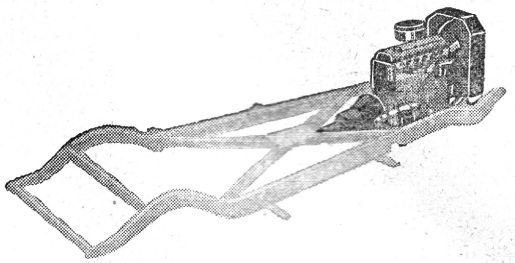
(a) Assembly of a Car embodying a normal Chassis

THE car owner who knows what happens when he carries out any of the operations inseparable from driving his car—de-clutching, gear changing, accelerating, braking and so on—will be better able to obtain maximum performance and pleasure from his vehicle. Here we build, pictorially, and in simple stages (a) a car embodying a chassis and having the body attached to it and (b) a car wherein the body is built as a complete shell and stressed in such a manner that it is able to take the place of a normal chassis.



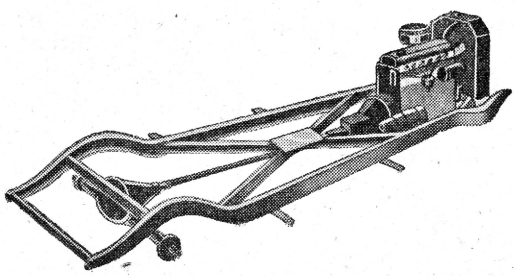
1. The Frame is first

The frame is the foundation of the car. Most frames are constructed on two steel beams made rigid by cross members. There are some frame designs which utilize a single central tube with the body and other components carried on outrigger arms attached to the main frame tube.



2. Then the Engine, Clutch and Gear Box are added

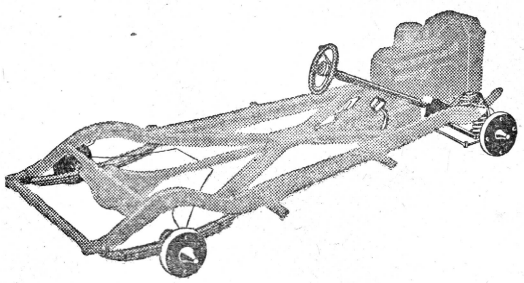
The engine is usually bolted in the frame at three points and mounted on rubber to minimize vibration. The clutch allows you to connect the power of the engine to the gear box or disconnect it from it. The gear box, in turn, allows you to select a gear which is most suitable.



3. Next come the Propeller Shaft, Universals and Rear Axle

The propeller shaft transmits the power from the gear box to the rear axle, the universals being flexible joints which allow the assembly to flex and yet continue to transmit power smoothly when the car is travelling over uneven surfaces.

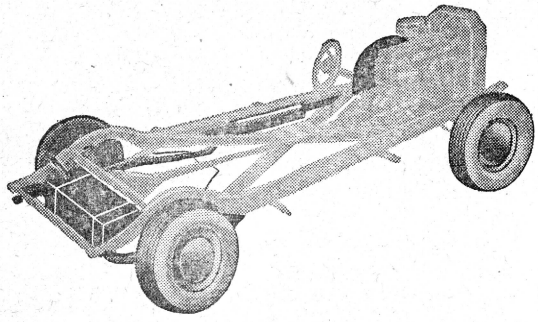
The rear axle casing houses the differential, which turns the drive through a right angle to drive the rear wheels and also allows the rear wheels to turn at different speeds when rounding corners.

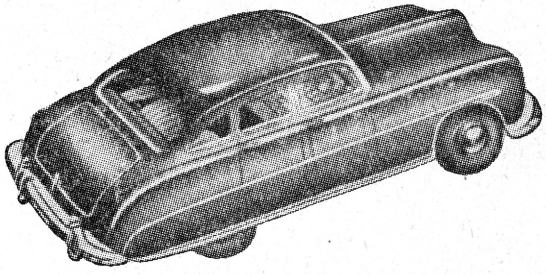


4. We add the Front and Rear Suspension systems, Front Axle, Front and Rear Brakes, and Steering Mechanism

To provide insulation from road shocks for the passenger, and to improve comfort, springing systems are used. The front stub-axles, the steering wheel and column, steering box, gear change lever and the necessary linkage are fitted now. The stub-axles carry the front wheels and also pivot to allow the wheels to turn when the steering wheel is turned. The brakes also are added.

. . . . If you see it this way





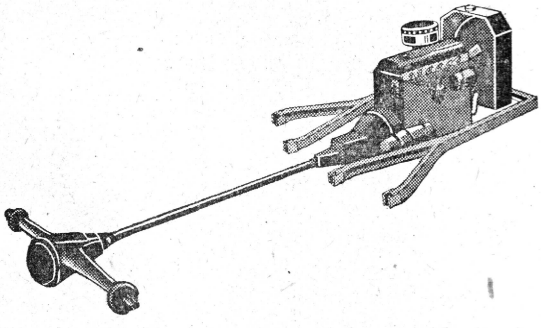
5. To complete the Chassis

Wheels and tyres, exhaust and silencing system and petrol tank are now fitted. On some cars the dashboard and instruments are also fitted at this stage.

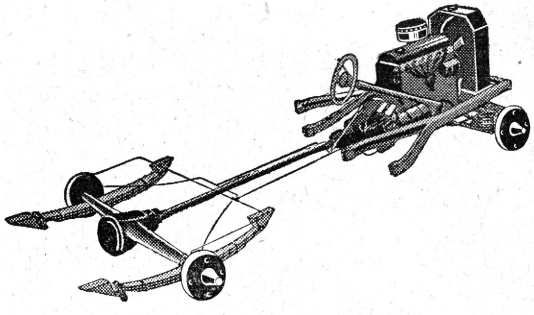
6. Final Assembly

Finally, the body is added and all electrical units — lights, petrol pump, coil, windscreen wipers, and instruments—are wired up. After a check by an inspector and a test run, the car is ready for delivery.

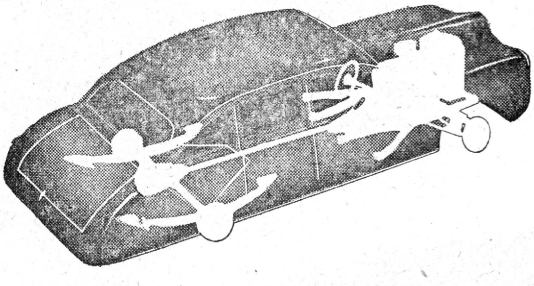
(b) Assembly of a Car in which the Body is designed to be strong enough to take the place of the Chassis



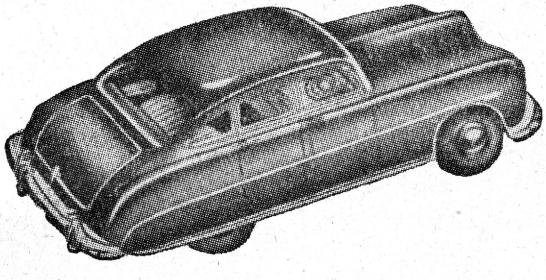
1. The engine, gear box and propeller shaft are assembled first.



2. Front and rear suspensions. Braking systems are mostly hydraulic.



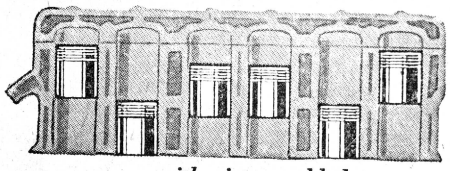
3. The body—a complete "shell"—does away with separate chassis.



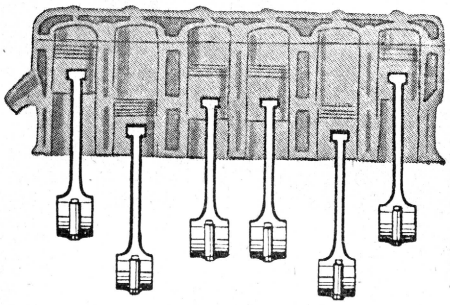
4. Wheels and tyres are added and electrical components wired up.

Now, let's see what is under the Bonnet

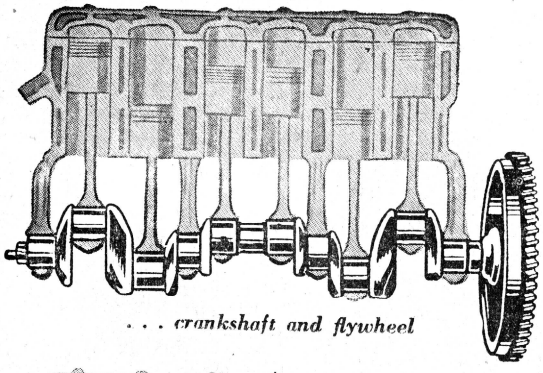
Cylinders and heads



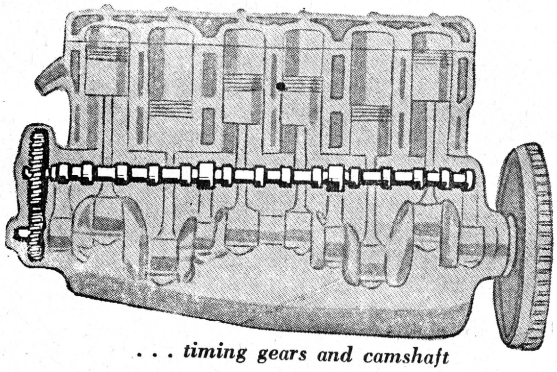
. . . with pistons added



. . . also connecting rods



. . . crankshaft and flywheel



. . . timing gears and camshaft

THE engine is made up of a group of cylinders — two, four, six, eight or twelve in number. A cylinder is simply a cylindrical hole, accurately bored in a hollow block of cast iron, called a cylinder block. The block is hollow to allow cooling water to circulate around the cylinder. The top of the cylinder is sealed by a cylinder head.

There's only one movable thing in each cylinder. It is called a piston and it's like a plunger in a bicycle pump. A piston can move only in two ways — up and down within the cylinder in which it travels.

The connecting rod holds the piston in its cylinder and is rightly termed, for it "connects" the piston to the crankshaft.

At the top of the connecting rod, where it is attached to the piston, there is a mechanical movement similar to the movement of your wrist joint. This is accomplished by means of a "gudgeon pin" or "Wrist pin."

At the other end of the rod, where it connects with the crankshaft, there is another bearing, known as a "connecting rod bearing," or "big end" bearing.

The Crankshaft

A crankshaft simply means a shaft which is made up of a number of crank arms forged on one shaft—usually one crank arm for each cylinder.

Where the crankshaft fits into the crankcase there is a number of bearings to support it. These are the "crankshaft bearings."

A balance, or flywheel, with gear teeth cut in it, is bolted to the rear end of the crankshaft. This helps smooth out the flow of power impulses from the engine.

At the other end of the crankshaft there are two gears in constant mesh with each other. These are known as "timing gears," because they "time" the opening or closing of the valves through the camshaft.

The Radiator cools the circulating water which carries the heat away from the cylinder and cylinder head (further details are explained on Page 14).

The engine assembly is completed by fitting the carburettor, gasoline pump and ignition system, each of which is described in later pages.

The Engine wouldn't run without Valves

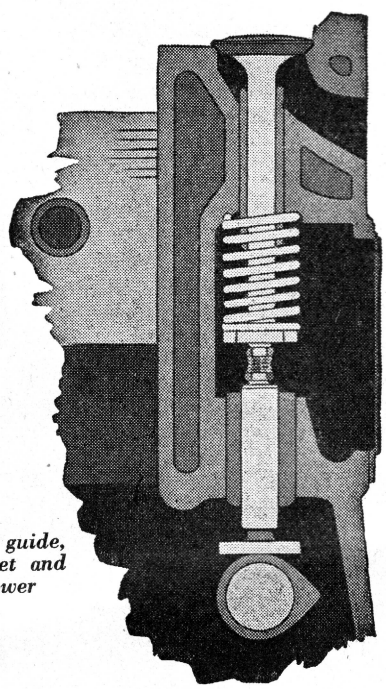
The camshaft is a shaft carrying a number of cams—two for each cylinder—whose function is to lift, at regulated intervals, the mechanism which opens the valves.

For each cylinder there are two tunnels cast in the cylinder head, or—in the case of a side valve engine—in the cylinder block. One is for the passage of the incoming air/gasoline mixture from the carburettor to the combustion space in the cylinder between the top of the piston and the cylinder head; and the other for the outgoing exhaust gases after combustion has taken place.

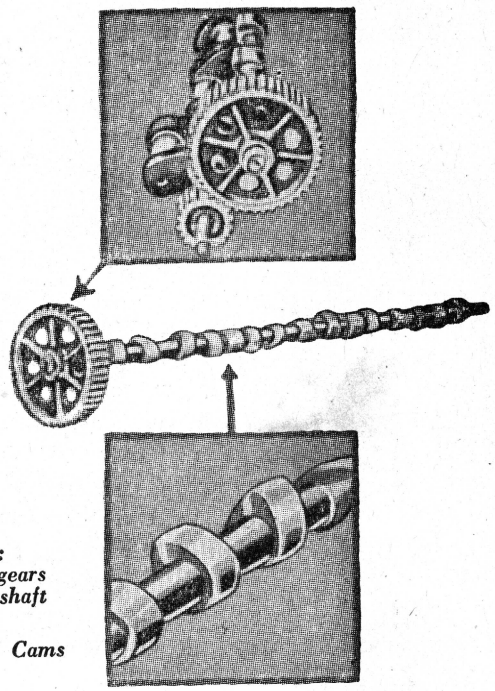
These tunnels terminate in openings facing directly into the combustion space and are closed and opened by tulip-shaped valves. When these valves are in the closed position a ground face on the outer circumference of the valve head makes perfect line contact all round with a corresponding seat on the inner circumference of the opening in the cylinder head, thus securely sealing it.

The valve stem serves three main purposes:—

1. It passes through a long bearing called a valve guide, enabling the valve head to rise and fall truly and seat accurately each time.



Valve, valve guide, spring, tappet and cam follower



ABOVE: Timing gears and camshaft

RIGHT: Cams

2. To transmit the movement imparted by the cam, to the valve head, thus opening it and closing it.
3. To carry heat away from the valve head, and pass it on through the valve guide to the cylinder head.

It would not be practical for the valve stems to make direct contact with the cams as they would quickly wear out. Therefore, cam followers, commonly called tappets, which are adjustable in length, are placed between the valve stems and the cams. These are caused to move up and down by the cams on the camshaft, and can be adjusted to take up wear.

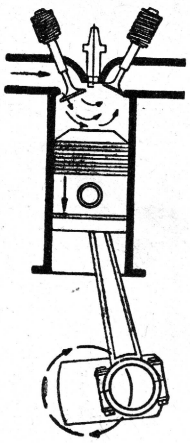
When the valves are closed they are held on their seats by stiff coil springs. Timing gears control the cam movements, which thereby open and close the valves at the right moment.

Exhaust and Inlet Valves

Each cylinder must have at least two valves. One, called the "inlet" valve, admits the fuel charge of gasoline vapour and air into the cylinder; the other, known as the "exhaust" valve, allows the burned gases to be expelled.

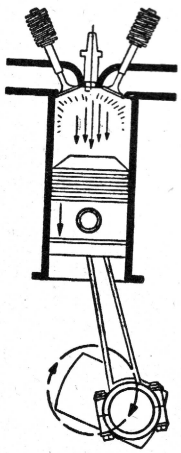
Why it's called a Four-Stroke Engine

THE four-stroke engine is so called because it takes four complete strokes of the piston (two down and two up) to complete the one power cycle.



Inlet Stroke

The first stroke of the cycle is the *inlet stroke,* during which the piston travels *down* the cylinder, creating a vacuum in the cylinder as it does so. The outside air pressure being greater than that now in the cylinder, air rushes in, via the carburettor and the inlet valve, to fill the space left empty by the moving piston. The air passing through the carburettor draws the gasoline with it and there is now a highly combustible mixture in the cylinder.

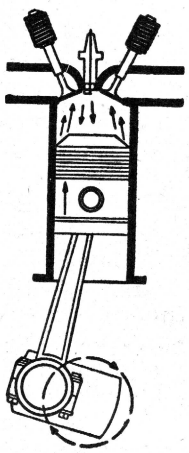


Power Stroke

As the mixture burns it expands very rapidly and with terrific power forces the piston down again. This stroke of the piston is called the third stroke or *power stroke.* Both valves remain closed; the rapid expansion of the gases forces the piston down, that being the only part of the assembly which can move at this point in the cycle. The power is then transmitted through the connecting rod which turns the engine crankshaft . . . and so on, through the gear box and rear axle, to the back wheels. This is the only stroke in all four-strokes which actually produces power.

The second stroke or *compression stroke* is named thus because both valves are closed as the piston travels back up the cylinder, and, there being no way for the combustible mixture in the cylinder to escape, it is "squeezed" or compressed between the piston and the cylinder head.

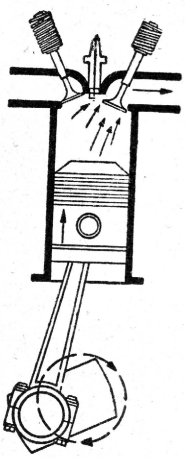
Just before the piston reaches top dead centre, the electrical system causes a spark to occur at the spark plug gap and this ignites the mixture.



Compression Stroke

When the piston nears the bottom of the cylinder the exhaust valve begins to open and as the piston moves up on the 4th stroke of the "cycle" it pushes the burnt or 'exhausted' gases (hence the term "exhaust") out past the open exhaust valve and through the exhaust port and pipe to the atmosphere.

This stroke completes the "cycle" of operations of a four-stroke engine, the next stroke (a 'down' stroke) being the inlet stroke of the succeeding "cycle."



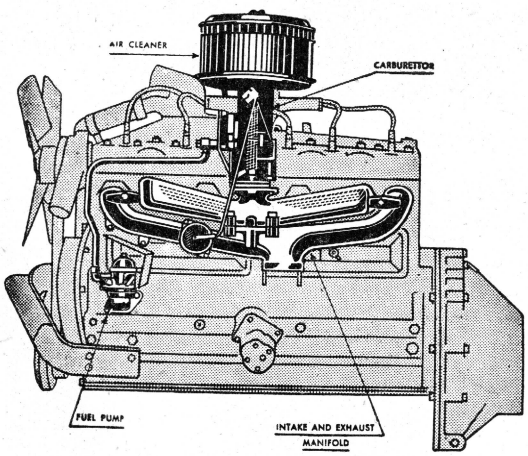
Exhaust Stroke

We add the Fuel, Electrical and Cooling Systems

THE fundamental principles upon which the car engine operates have now been described but there are a few more units still to be described before the assembly is complete.

First, the fuel system. It consists of a fuel pump which pumps the gasoline from the main gasoline tank to the engine. From the fuel pump the gasoline passes into a carburettor in which the gasoline is mixed with air and atomised before it is sucked into the cylinders.

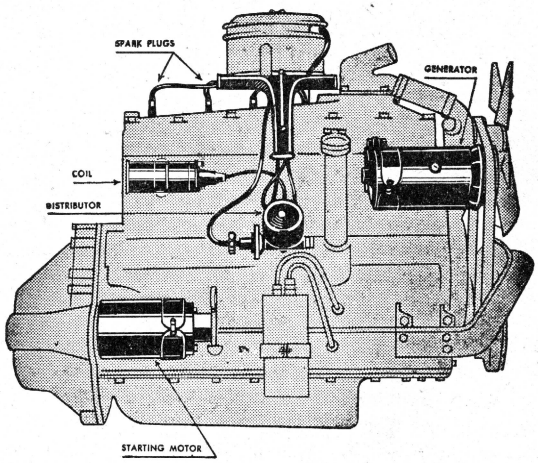
The charge enters the cylinders through the intake manifold, a pipe-like arrangement bolted to the sides of the cylinders.



The burnt gases leave through another pipe called the exhaust manifold.

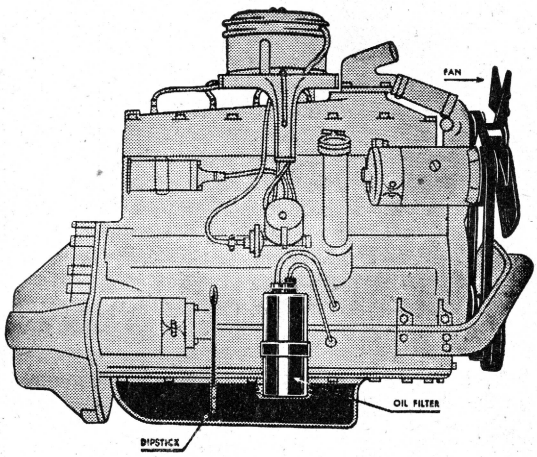
Secondly, the electrical system. It consists of an electrical generator or dynamo, a distributor which distributes the electricity to the spark plugs in the correct order and a starting motor which can turn the engine mechanically.

To complete the assembly, a battery, an ignition coil, a horn, lights, windscreen wipers and perhaps a radio or a cigarette lighter, are added.



Next comes the cooling fan, which is fitted immediately in front of the engine. Its job is to aid in cooling the water in the radiator and thus cool the engine. The cooling fan is driven directly from the crankshaft by a belt.

The crankcases of most engines are made in two parts, which are bolted together. The bottom half is the oil reservoir and the oil pump is located at the lowest portion of the crankcase in a section called the "sump." There is a metal wire screen surrounding the pump to prevent any foreign material from entering the oil system.



When you press the Starter

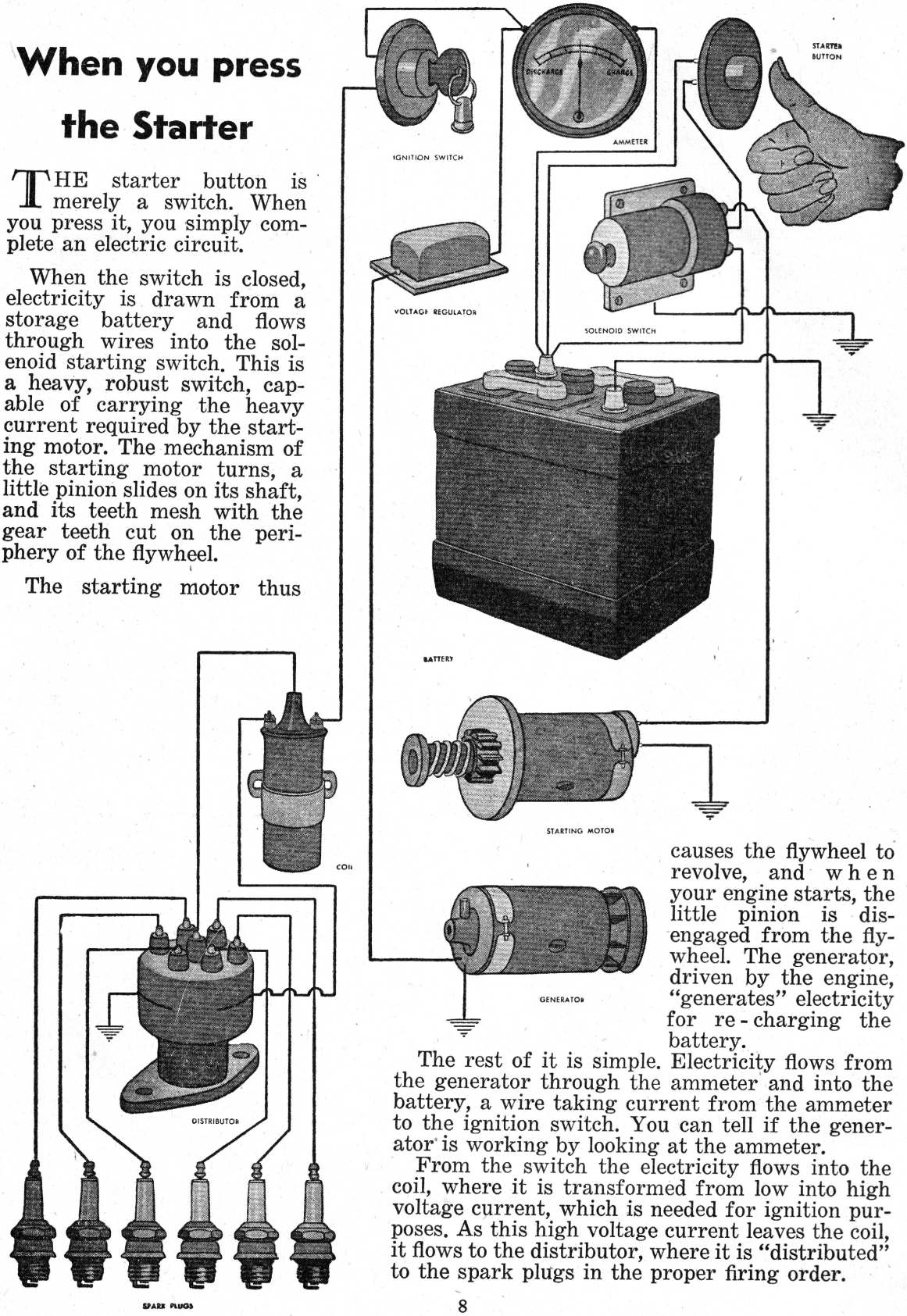
THE starter button is merely a switch. When you press it, you simply complete an electric circuit.

When the switch is closed, electricity is drawn from a storage battery and flows through wires into the solenoid starting switch. This is a heavy, robust switch, capable of carrying the heavy current required by the starting motor. The mechanism of the starting motor turns, a little pinion slides on its shaft, and its teeth mesh with the gear teeth cut on the periphery of the flywheel.

The starting motor thus causes the flywheel to revolve, and when your engine starts, the little pinion is disengaged from the flywheel. The generator, driven by the engine, "generates" electricity for re-charging the battery.

The rest of it is simple. Electricity flows from the generator through the ammeter and into the battery, a wire taking current from the ammeter to the ignition switch. You can tell if the generator is working by looking at the ammeter.

From the switch the electricity flows into the coil, where it is transformed from low into high voltage current, which is needed for ignition purposes. As this high voltage current leaves the coil, it flows to the distributor, where it is "distributed" to the spark plugs in the proper firing order.



The Distributor merely "distributes" the sparks

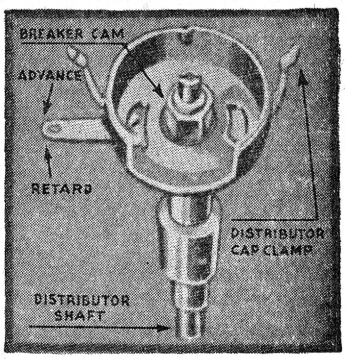
THE distributor is a moulded bakelite cap, in which the spark plug wires connect to the brass pick-up terminals.

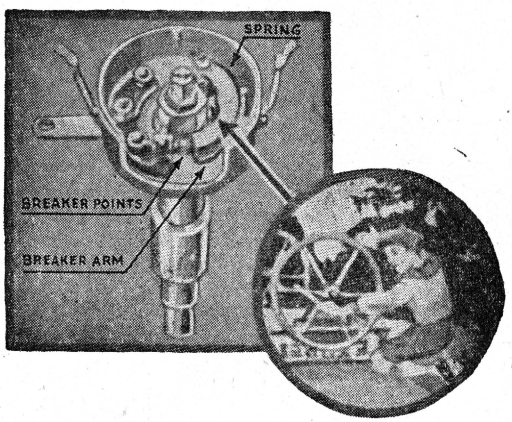
Remove the cap and rotor, and you will see the upper end of the steel spindle. This is the end of the distributor shaft, revolved by gears from the camshaft.

Integral with the shaft is the contact breaker cam, and it has as many sides as your engine has cylinders.

The contact breaker arm is hinged at one end, thus allowing it to swing. In the centre of the arm is a block of fibre, which is held against the breaker cam by a spring. Attached to the free end of the breaker arm is a platinum breaker point. Opposite this point is another one on a fixed arm.

When the breaker cam revolves, the free end of the breaker arm swings back and forth, as the fibre follows the bumps on the breaker cam. It's like holding a stick against the spokes of a revolving wheel.





The contact breaker

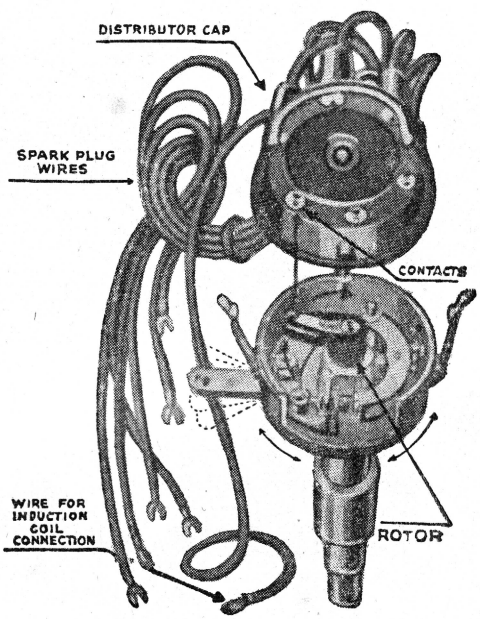
Quite naturally, the breaker points come together and then break, hence the name "breaker points." One of these points is adjustable for clearance. It is a wise plan to let the dealer from whom you purchased your car make all ignition adjustments.

One purpose of the distributor is to interrupt the flow of current to the spark plugs. The opening and closing of the points make it possible for the sparks to occur when they are needed.

The second function of the distributor is to "distribute" the sparks to the proper spark plugs. Your rotor does this, by making electrical contact with the studs embedded in the distributor cover.

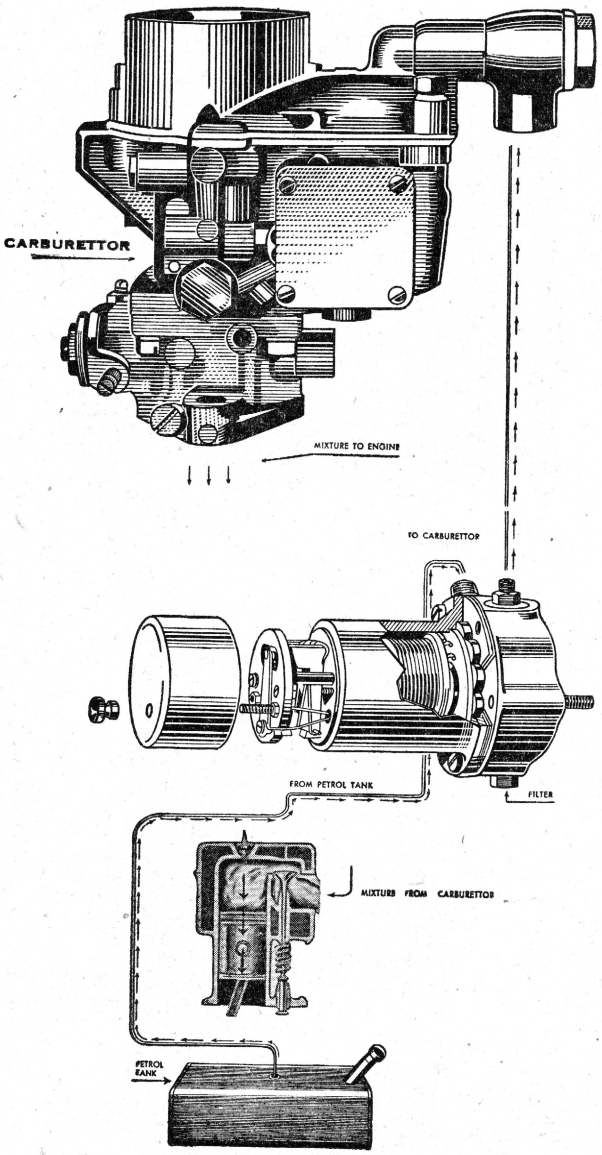
In advancing or retarding the spark you turn the distributor round through a few degrees back against the direction of rotation, or through a few degrees in the direction of rotation, as the case may be. This makes the sparks occur earlier or later.

The high octane rating of Mobilgas Special permits use of the ideal ignition setting, enabling your engine to deliver ALL the power built into it by the manufacturer.



When you press down on the Accelerator

WHEN the starting motor turns the crankshaft the pistons move up and down in the cylinders. In the process a charge of gasoline and air is sucked into the cylinders and when this is ignited by the spark plug, the engine starts.



The idea is to get the fuel to the cylinders in the most suitable form for combustion, that is, with the proper proportions of gasoline and air. This is the way it is done.

We have seen that the pistons cause a suction. This suction draws gasoline and air from the carburettor, through the inlet manifold into the cylinders.

The carburettor is simply a device which mixes gasoline and air in the proper proportions and at the same time atomises the gasoline. The inlet manifold conveys the gasoline and air 'mixture' to the cylinders.

Frequently the fuel tank is lower than the carburettor. For this reason a fuel pump is used to pull the gasoline uphill from the main gasoline tank and pump it to the carburettor.

When you press down the accelerator, you open, through suitable linkage, a valve in the carburettor and permit a charge of gasoline-air mixture to enter the cylinder —just like turning on a tap.

Naturally, the further you press down the accelerator, the more gasoline-air mixture can be sucked into the cylinders because the throttle valve of the carburettor is opened wider. The result is that the engine develops more power and turns more quickly.

Remember that the more gasoline-air mixture admitted into the cylinders, the greater the power and the greater the speed of the car. When you take your foot off the accelerator pedal, the throttle valve of the carburettor closes and this naturally reduces the power and speed of the engine.

Some cars are fitted with a hand throttle. This control also operates the throttle valve of the carburettor and keeps this valve open at a fixed position. As a richer mixture is required for acceleration, the throttle valve of the carburettor operates an accelerating pump which injects gasoline direct into the carburettor throat. It is on account of this fact that the accelerator pedal should never be jiggled up and down as this will allow excess gasoline to enter the cylinders and may cause the engine to stall.

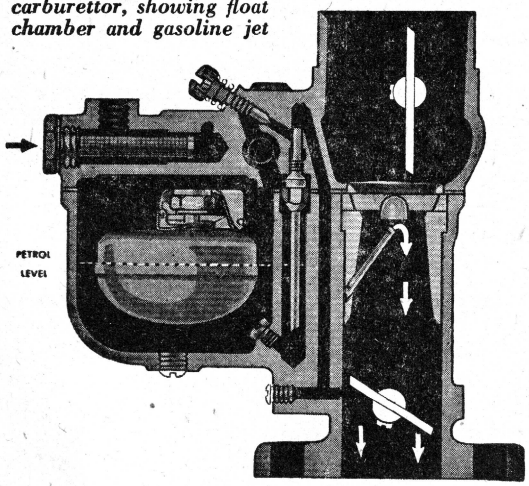
The Carburettor simply mixes gasoline with air

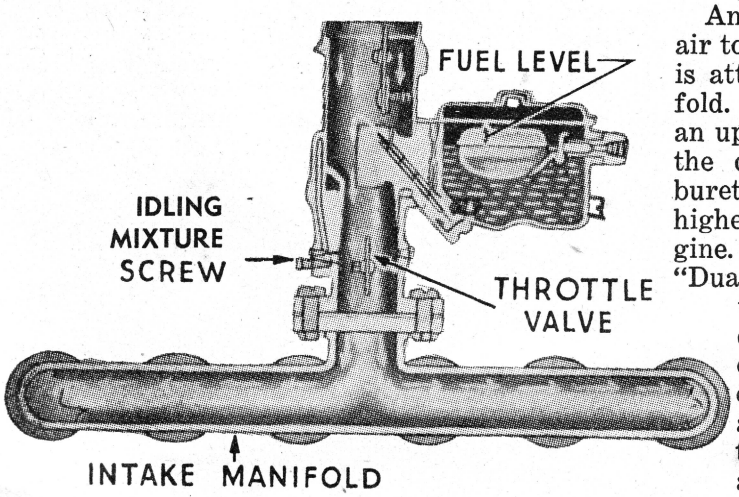
GASOLINE requires air to allow it to burn. Therefore, all car engines are fitted with carburettors, which, as we have just seen, mix gasoline and air together.

An important part of the carburettor is the float chamber where gasoline is stored prior to being mixed in the proper proportions with air. The quantity of gasoline admitted to this chamber is controlled by a float and valve not unlike that used in a water tank.

The gasoline leaves the float chamber through a metal jet. This is a hollow tube filled almost to its brim with gasoline. The level of the gasoline in the jet is the same as that in the float chamber. This jet is surrounded by a pipe connected to the inlet manifold. When the engine is started, the pistons create a vacuum in the cylinders and air rushes in through the carburettor and past the jet into the inlet manifold. As it passes the jet it carries along with it a quantity of the gasoline which was all but overflowing from the tip of the jet.

Cross section of a typical carburettor, showing float chamber and gasoline jet





Gasoline doesn't enter the cylinders in drops. The inrush of air breaks it up into a mist which renders it easier to ignite. The proportion of fuel and air sucked into the cylinders varies in accordance with the size of the carburettor jet.

Some carburettors are fitted with two jets which are not adjustable in size. One of these is for high engine speed and the other for low engine speed. Two jets give greater flexibility and economy to the engine over a wide range, from idling to full speed.

When you use the choke, you enrich the gasoline-air mixture by decreasing proportion of air admitted to the carburettor.

The illustration shows a carburettor mounted above the inlet manifold. In carburettors of this type, the air passes in a downward direction through the carburettor to the inlet manifold and thence to the cylinders. These are known as "down-draught" carburettors.

Another type of carburettor allows the air to enter horizontally as the carburettor is attached to the side of the inlet manifold. The older type of car was fitted with an up-draft carburettor. The advantage of the down-draft or horizontal type carburettor is that more horse power and higher efficiency is obtained from the engine. Some carburettors are referred to as "Dual" which means that there are two throats—each throat feeding 4 cylinders in an 8 cylinder engine. Other engines are fitted with more than one carburettor to increase the efficiency and with a view to making sure that the maximum amount of gasoline and air mixture enters the cylinders.

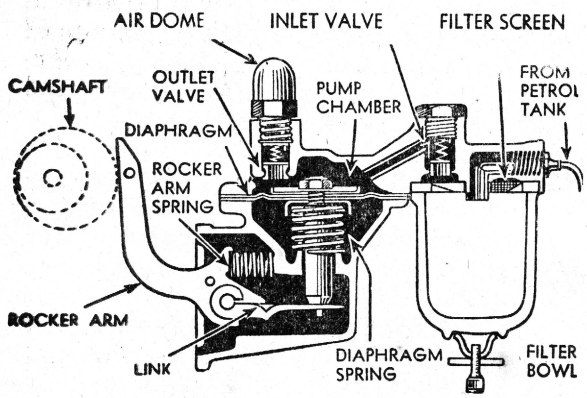
How gasoline is drawn from Tank to Carburettor

THE majority of modern cars have their gasoline tanks located at the back and at a level lower than the carburettor. This is particularly so when a down-draught carburettor is fitted, which is mounted very high up on the engine. Where the gasoline tank is fitted behind the dash, the fuel is fed by gravity to the engine and requires only a tap so that the gasoline can be turned off when carburettor maintenance is necessary; otherwise a pump is required to "lift" the gasoline from the tank at the rear, up to the carburettor float chamber (at the engine).

There are two types of pump in use to-day. The electrical type, illustrated on Page 10, and the mechanical type, shown on this page. The electrical type begins to operate immediately the ignition switch is switched on—and, if for any reason the float chamber is empty, the pump may be heard clicking as it fills the chamber with gasoline.

The mechanical type is operated by a cam on the camshaft and pumps only when the engine is running. This type often has a priming lever by means of which the gasoline may be pumped to the carburettor manually during maintenance work, thus avoiding the physical effort or battery drain involved in cranking the engine to allow the pump to fill the float chamber.

In either case the gasoline is drawn from the tank, by the pump, and is forced under pressure through a filter or filter bowl and on to the carburettor float chamber. Naturally the pumping capacity of the pump is in excess of the maximum requirements of the engine.



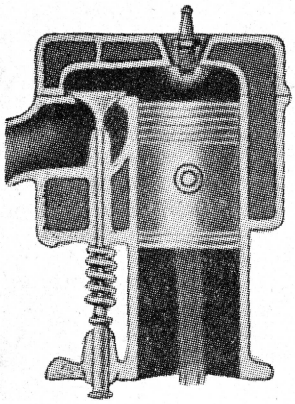
It doesn't take much to cause annoying Carburettor Troubles

Water and foreign material such as road dirt and dust can soon block carburettor jets. It is for this reason that filters are fitted in the fuel system. Water may find its way into the fuel even if none is present when the gasoline is bought. This is caused by the condensation of the moisture in the air which enters the tank as the gasoline is being used. The tank is vented to the atmosphere to allow the air to enter, otherwise the gasoline would not flow. The condensation occurs on the sides and top of the gasoline tank as the outside temperature of the tank cools. It is on account of this fact that the tank should always be kept full of Mobilgas, particularly when a car is idle.

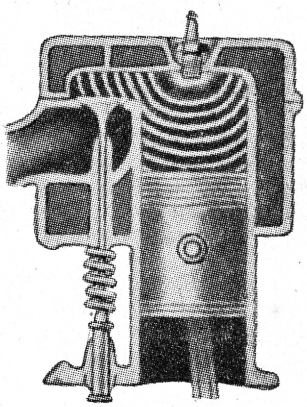
Vapour Lock

One of the most baffling causes of engine stoppage is gasoline starvation due to "vapour lock." Gasoline in the float chamber or in the fuel lines evaporates and does not arrive at the jet in the liquid form necessary for carburetion. This is brought about by high temperatures under the bonnet or a fuel line being too close to some hot component such as the exhaust manifold, or a combination of both. It will correct itself if the engine is allowed to cool, but a cure may often be effected by bending the gasoline lines away from the engine. "Vapour Lock" usually occurs when car is stationary after a run in hot weather because then the heat from the engine which is usually swept astern will be radiated to the fuel system, as is evidenced by the fact that the engine will not start. Cooling the engine by parking so that a breeze will pass through the radiator or in the shade, will often eliminate the trouble. If the fuel pipe connecting the back tank to the fuel pump is not tight, air will leak in which will prevent gasoline being pumped and this will also prevent the engine from starting.

Some thoughts about your Engine



THE normal car engine is called an internal combustion engine because the combustion of the gasoline-air mixture takes place "inside" the cylinder. A steam engine is an "external" combustion engine because the fuel is burned in another chamber "outside" the engine cylinder.



SPARK ← → POWER

After the gasoline-air mixture is sucked into the cylinder, the piston compresses it into a small space. This is called the compression space and the ratio that the total space in the cylinder, when the piston is at the bottom of its stroke, bears to the space above the piston when it is at the top of its stroke is known as the compression ratio.

The power of the engine is largely dependent upon this ratio. Broadly speaking, the higher this ratio, the greater the power and efficiency of the engine. Acceleration and mileage are improved as the compression ratio is increased. But the compression ratio is limited by the fuel being used.

The average compression ratio of a modern car is $6\frac{1}{2}$ to 1.

What happens when the Spark fires the mixture

When the spark from the spark plug fires the mixture, it burns swiftly and with terrific heat, developing very high pressures. Something must move and as the piston is the only movable thing in the cylinder it is forced downward at great speed.

The pressure is transmitted from the piston, through the connecting rod to the crank arm. Naturally the crankshaft turns round thereby producing the power to run the car.

The heat developed may reach 2700° F.

Just a word or two about heat. The burning gasoline-air mixture expands, thus producing power in the engine. Heat and pressure always work hand in hand. The heat developed during this process may result in a temperature of 2700°F. Compare this with the temperature of boiling water, 212°F.

Twenty-seven hundred degrees Fahrenheit is just about the melting point of iron, so you must cool the engine to prevent it from melting. If the engine were not cooled, its working parts would fuse together and it would be wrecked.

The pistons in a car engine move up and down within their respective cylinders at great speed. When an engine with a $4\frac{1}{2}$ in. piston stroke is running at 1200 revolutions per minute—a car speed of approximately 25 miles per hour in top gear—each of its pistons is travelling up and down within its respective cylinder at a rate of 900 feet per minute.

PROTECT
the upper cylinder areas of your engine by always using
Mobil Upperlube
It will save you money

Cooling the Engine

THE quickest way to ruin a saucepan is to subject it to heat without putting any water in it. Without water to keep the temperature down the metal will soon be destroyed. The same is true of your engine.

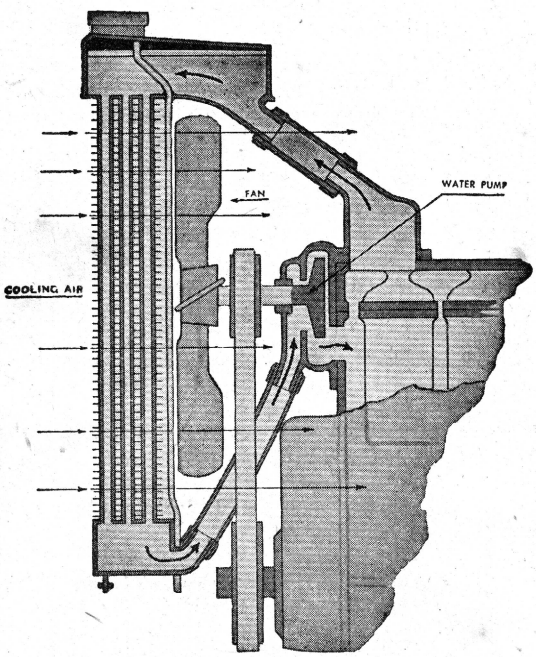
Most passenger car engines are water-cooled, which means that they rely upon water to carry away the terrific heat developed in them.

All water-cooling systems employ a radiator for cooling the water which circulates through the jackets surrounding the cylinders.

The water in the jackets absorbs the heat from the cylinders, and carries it to the radiator, where it is cooled by flowing through tubes exposed to the moving air.

There are two types of Water-cooling Systems

The thermo-syphon is the simplest system. It works on the principle that hot water rises, while cold water descends, thereby creating its own self-acting circulating system.



The other system is like this also, with the exception that a revolving pump forces the water through the entire engine cooling recesses, under some pressure.

In both these systems the water is open to the atmosphere via an overflow pipe and therefore the water boils at 212°F.

Nowadays, some cars have radiators which are sealed and operate under a slight pressure, which has the effect of raising the temperature at which the water boils.

This results in more efficient running and reduced water loss.

A blow-off valve is included as a safety measure.

Water in the cooling system circulates rapidly. It makes a complete circuit every minute, when you drive at a speed of twenty-five miles an hour.

The water pump is important. Unless properly cared for, it will not turn freely, or it may leak.

Directly behind the radiator is the fan. It revolves faster than any other part in the engine. The fan aids in cooling by sucking air past the radiator passages through which the cooling water circulates. Considerable power is exerted to drive the fan and it therefore requires correct servicing.

Some engines are cooled entirely by air. Air is directed to blow on to and past the cylinders, which are fitted with fins, thus presenting a larger area of metal to the air, to get rid of as much heat as possible.

Practically all motor cycle engines are air-cooled, as well as a large number of well-known makes of aircraft engines.

Silencing the Exhaust noise

THUNDER is produced by lightning, which heats the air around it and causes it to expand with great rapidity. The expanding air causes the crash. The noise is called thunder.

We have described the great heat and pressure under which the engine operates. The hot exhaust gases, produced by the combustion of the gasoline-air mixture, are expelled at high temperature and speed. Naturally, they expand very quickly.

When your car is travelling at twenty-five miles per hour, the exhaust gases are expelled from the engine at a pressure of approximately twenty-five pounds per sq. inch—as great as the pressure in a tyre.

The hot, expanding gases hit the outside air with a bang. You have heard the exhaust of an aeroplane engine. Your engine would sound much the same without some form of efficient silencer.

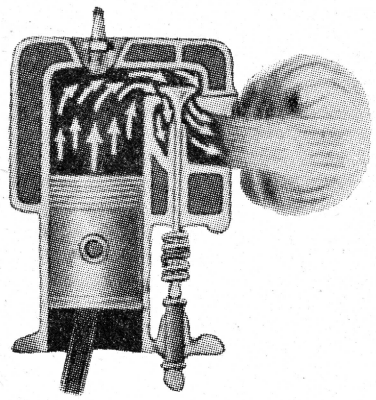
The secret of a quiet exhaust is to allow the gases to expand slowly and uniformly. That is what the silencer does for your car.

Instead of permitting the exhaust gases to come into immediate contact with the air, they are caught at the exhaust manifold and led through a long pipe to the silencer, which simply muffles the noise.

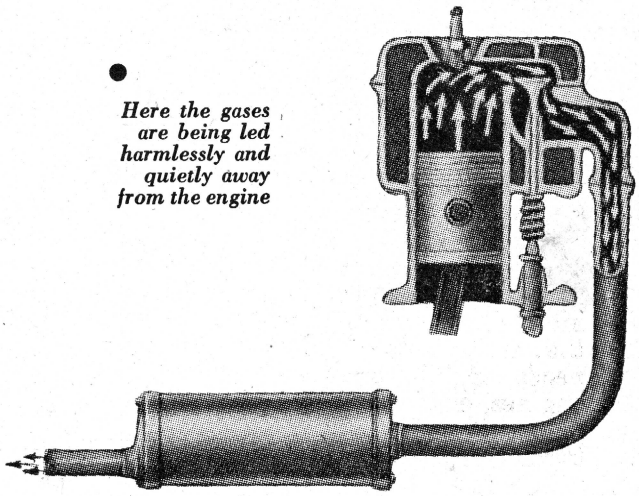
Silencers are of varying design, but they all work on the principle of allowing the gases to expand and cool before releasing them to the atmosphere.

A well-designed silencer in good order acts as an ejector, the vacuum behind one outgoing charge pulling the next one forward.

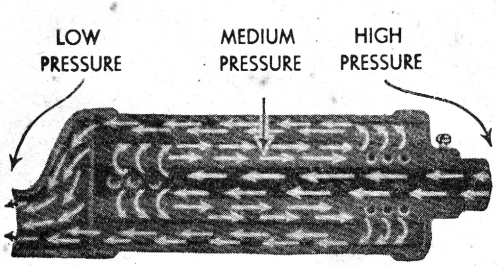
It used to be thought that, in order to silence the exhaust of an engine, it was necessary to cause the gases to pass through a tortuous series of spiral passages and perforated baffles. This type of silencer, apart from being only partly effective, causes excessive back pressure on the gases with consequent over-heating of the engine, particularly the exhaust valves. It is now recognised that restriction of the gases is not necessary. The annoying factor in exhaust noise is the high frequency component and this may be dissipated and absorbed by suitable design without incurring excessive back pressure. Some types of "straight through" silencers even have an unobstructed pipe down the centre with rows of holes along its length. Low frequency noises pass directly through but these are remarkably inoffensive to the human ear.



This is what would happen if there were no exhaust system . . . the hot gases would simply blast out with a deafening noise



Here the gases are being led harmlessly and quietly away from the engine



Gasoline does not ignite all at once

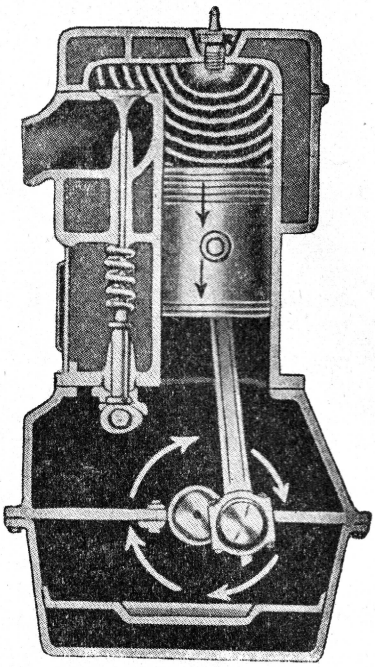
GASOLINE does not ignite all at once in a cylinder; it burns. If it did ignite "all at once" that would be instantaneous combustion, which is mechanically undesirable. The burning process is comparatively slower, though it takes place in a fraction of a second.

The shock of instantaneous ignition would simply jar the piston rather than push it down steadily and powerfully. It's a push—a steady, powerful push throughout the length of the power stroke—which produces maximum power, as illustrated below.

When the gasoline-air mixture is ignited in the combustion chamber, it burns with great rapidity and intense heat. As the burning takes place, the gases expand and develop a tremendous pressure upon the piston. Naturally, the piston moves down, and the gases continue to exert pressure until the piston reaches the bottom.

Gasoline must produce sufficient power to enable the engine to work at the maximum output that the manufacturer designed it to give. With an octane rating unsurpassed in the history of Australian motoring, Mobilgas Special—blended with Mobil Power Compound—provides a fuel that is more than sufficient to satisfy the needs of all post-war, high-compression engines, enabling them to deliver ALL the power built into them by the manufacturer.

The Mobil Power Compound in Mobilgas Special is the most powerful combination of chemical additives ever put in gasoline to step up engine performance.

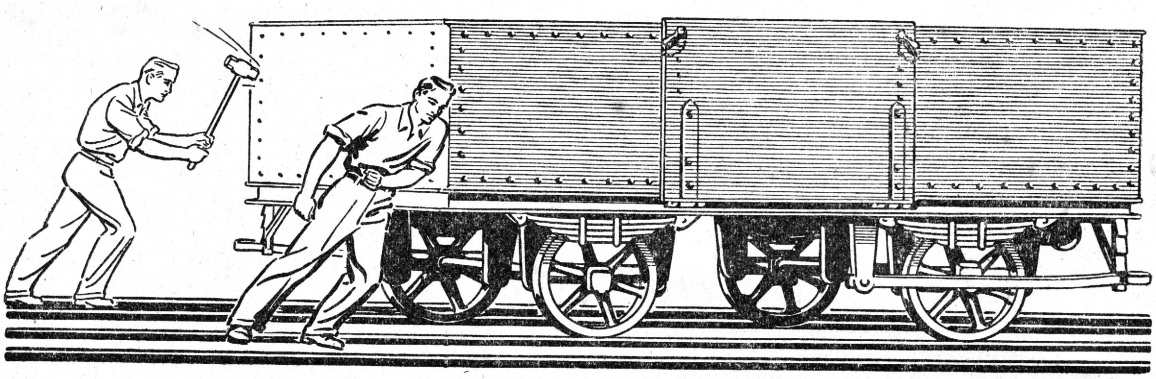


Power is transmitted by the ignited gasoline-air mixture to the crankshaft

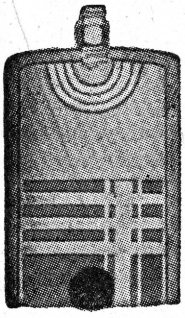
With Mobilgas Special, your engine will give:—

- KNOCK-FREE PERFORMANCE.
- SPLIT-SECOND STARTING AND FASTER GETAWAY.
- MORE USABLE POWER.
- INCREASED MILEAGE.
- LONGER ENGINE LIFE.

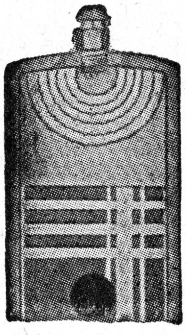
Mobilgas Special and Mobilgas are the world's greatest-selling gasolines . . . they're the best your money can buy.



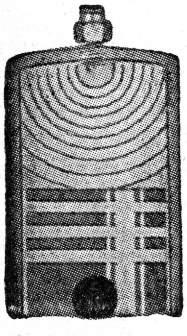
Difference between perfect & imperfect combustion



Igniting the Charge



which burns evenly



and Powerfully

PERFECT COMBUSTION

MANY motorists have heard the metallic "ping ping" which occurs when a car is labouring up a hill or is called on for quick pick-up in traffic. Some call it "engine knock," others "detonation," but few know what it really is. However, *all* motorists know that "knocking" means lost power; that it racks the engine and lowers the possible mileage per gallon, and *all* wish that the knock could be avoided.

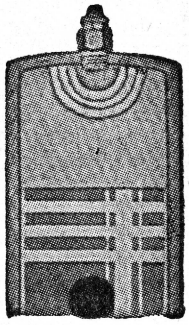
The diagrams on the left illustrate perfect combustion. The high anti-knock quality of this gasoline enables it to stand up to high temperatures and high compressions. It powerfully resists the disrupting influences of high compression and ensures even and steady combustion.

Getting that Powerful, Thrusting Push to the Piston

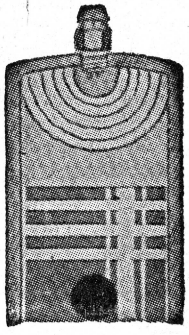
The expansion of the gases following the completion of this correctly timed combustion delivers a powerful thrusting push to the piston throughout the full length of the power stroke. Mobilgas gives maximum power without knocking. It enables you to climb hills in top gear when, if ordinary gasolines of lower anti-knock quality were used, it would be necessary to change to a lower gear. This would mean additional fuel consumption.

The diagrams on the right show how "knocking" occurs with gasolines of low anti-knock quality.

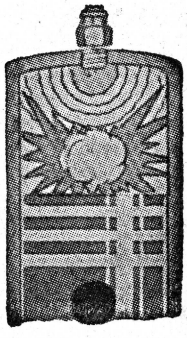
The spark ignites that portion of the charge which surrounds the spark plug and combustion begins to spread through the whole fuel charge. The squeezing effect of the still rising piston, plus the rising temperature and pressure of the ignited portion raise the temperature and pressure in the unignited portion of the charge to its self-ignition point. It "goes off" with a bang!



Igniting the Charge



which burns unstably



and Knocks

IMPERFECT COMBUSTION

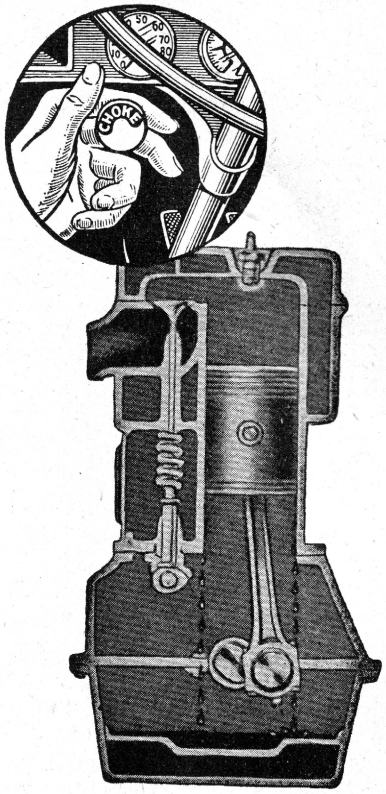
Flames rip through the charge, springing cylinder walls and hitting piston head like a riveter's hammer. The engine gives out a metallic high-pitched "ping." "Knocking" has occurred and power is lost. Retarding the spark may stop the knock but retarding is simply "shutting the stable door after the horse power's gone." To secure perfect combustion giving knock-free performance, always use Mobilgas Special.

The use of the Choke

A CHOKE is fitted to the carburettor of motor car engines to furnish the cylinders with extra gasoline for starting purposes.

Therefore, when using the choke a much larger quantity of fuel than is needed for normal running is sucked into the cylinders. If the gasoline used is not volatile enough, the heavier or less volatile portions will pass into the cylinders in relatively large drops.

Drops of liquid gasoline will cling to the oil on the cylinder walls and ultimately be mixed with the oil by the action of the pistons. As shown in the illustration, the mixture of oil and gasoline will finally reach the crankcase to dilute the charge of crankcase oil. Consequently, excessive use of the choke is a costly habit, because it not only wastes gasoline but also promotes wear of the moving parts of the engine as a result of thinning out the lubricating oil. Excessive use of the choke also promotes cylinder wear and one means of minimising this effect is regularly to use a high quality upper cylinder lubricant such as Mobil Upperlube, added to the fuel. A gasoline of correct volatility requires less use of the choke than one of poor volatility. That is why we advise you to use Mobilgas always.



Dilution of crankcase oil

Automatic Chokes

The carburettors of many modern cars are fitted with automatic chokes so that the amount of fuel sucked into the cylinders during the starting period is regulated in accordance with the atmospheric and engine temperatures. In this way the amount of gasoline used during the starting period is reduced to a minimum.

The above problem of dilution of crankcase oil with unburned gasoline is particularly troublesome when a car is used intermittently for short runs. Under these conditions the engine never gets properly hot and the choke invariably has to be used each time the engine is started. A car operated under these conditions may go for weeks or even years without ever being properly warmed up and fuel dilution and cylinder wear will be at a maximum. It is good for such an engine to be operated under full load occasionally. This will tend to reduce crankcase dilution as it will evaporate some of the gasoline which has diluted the crankcase oil. Under these conditions the crankcase should be drained every 500 miles instead of the normal 1000 miles.

At the other extreme a vehicle which seldom gets cold, such as a car operating as a taxi, may be run for 16 or even 24 hours a day, and record a very much larger mileage with no appreciable wear, simply because the choke is almost never used and fuel dilution is at a minimum. Also since the oil is almost never cold, lubricating efficiency is at a maximum and the cold starting period, when wear is highest, is largely eliminated.

The selection of gasoline

AS will have been learned from the preceding articles, the quality of the fuel used has an important bearing on the efficiency and flexibility of the engine. Therefore, too much care cannot be exercised in selecting a gasoline of high quality and nation-wide availability giving:—

- **Split second starting**
- **Swiftest possible acceleration**
- **Greatest power and speed**
- **Knock-free performance**
- **Maximum mileage**
- **Greatest driving safety & satisfaction**

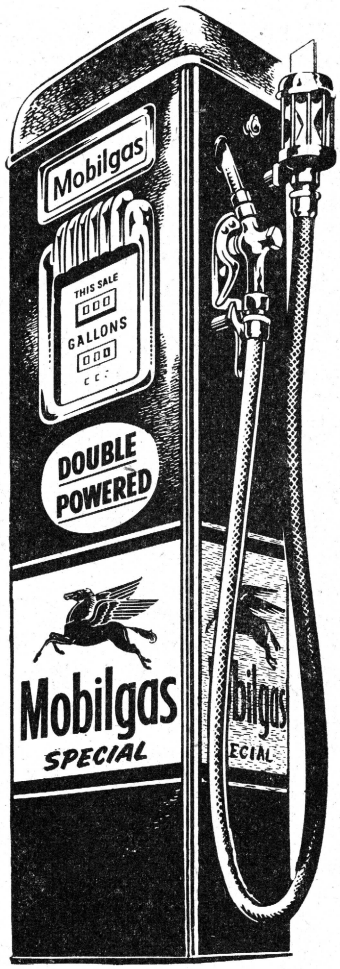
Mobilgas Special possesses all these attributes to the highest degree . . . and more. Out-selling all other premium grades of gasoline right throughout the world, Mobilgas Special combines:—

HIGHEST OCTANE RATING—unsurpassed in the history of Australian motoring . . . and

MOBIL POWER COMPOUND—the most powerful combination of chemical additives ever put in any gasoline to step up engine performance.

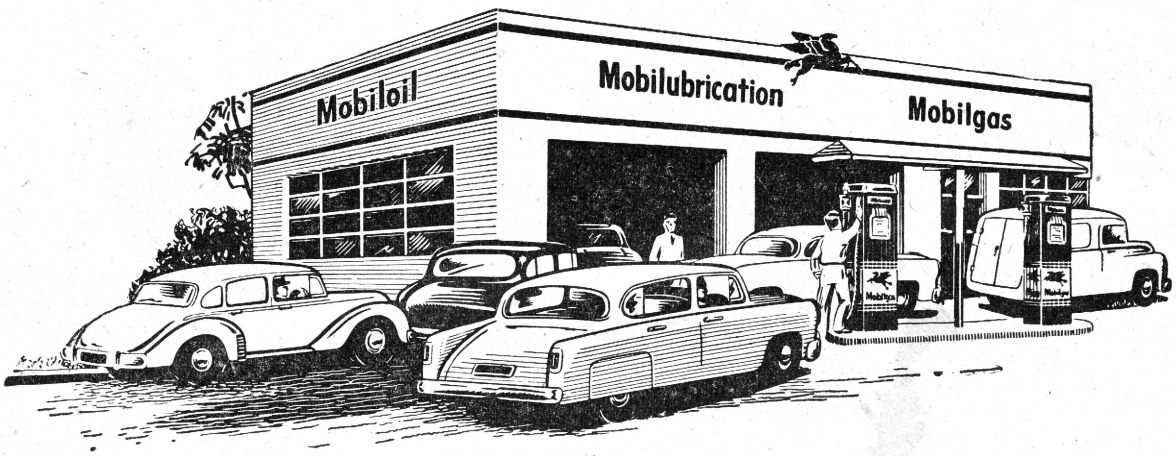
Mobilgas Special—with Mobil Power Compound—gives you for the first time a fuel with an octane rating more than sufficient to satisfy the needs of all post-war high-compression engines, enabling them to deliver ALL the power built into them by the manufacturer.

Mobilgas Special and Mobilgas—the world's greatest selling gasolines—are the best your money can buy.



A combination that will give you happy motoring

Mobilgas Special, Mobilgas, Mobiloil, Mobilubrication and Mobil Friendly Service



How the Engine is Lubricated

THERE are many kinds of lubricating systems, but those most generally used may be summed up in three types—or a combination of three.

The simplest — the splash system — splashes the oil to the moving parts by the revolving crankshaft, connecting rods and flywheel.

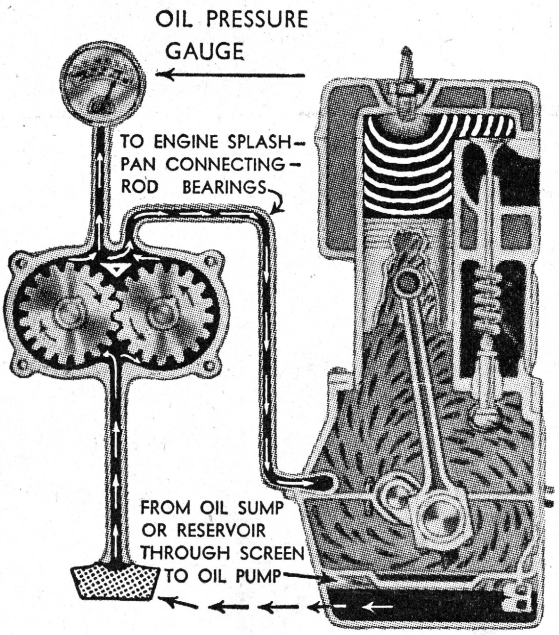
The splash and pressure system is another type. It splashes the oil to some of the parts and pumps it under pressure to the more important moving parts.

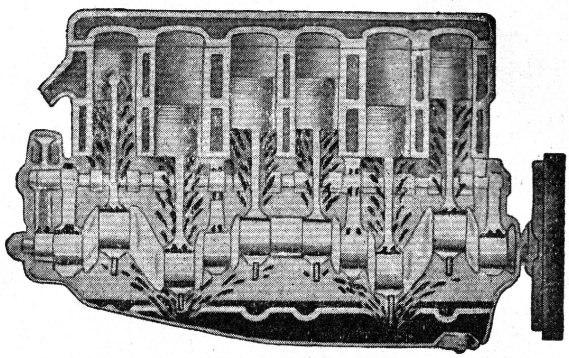
Then there is the full pressure system. In this type all the moving parts are lubricated by oil, which is forced to them by the pressure of a gear-driven oil pump.

In these days of high compression engines, faster road speed and higher engine speed, this system is used almost universally because of its positive action.

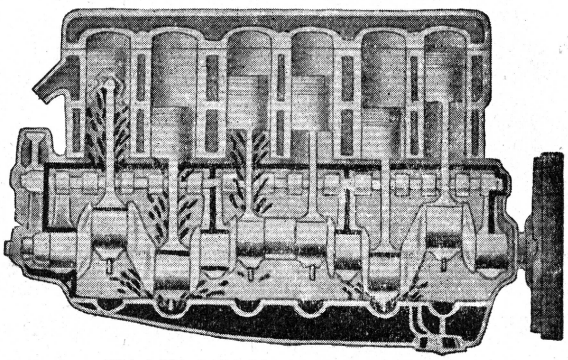
An oil pump consists of two gears encased in a close-fitting metal housing submerged in the lubricating oil at the lowest part of the engine crankcase. These gears mesh together and thus revolve in opposite directions. This draws the oil into the housing and forces it out under pressure to the parts which require to be lubricated.

An oil gauge is connected to the pump. It tells you nothing about the quality or quantity of your oil. It simply shows in pounds per square inch, the pressure exerted by the pump in forcing the oil through the engine, and its use is to tell you if the oil is circulating. It also gives a good indication of the condition of the bearings for, should the bearings be worn and slack, there will not be the resistance to the passage of the oil and the pressure will drop.

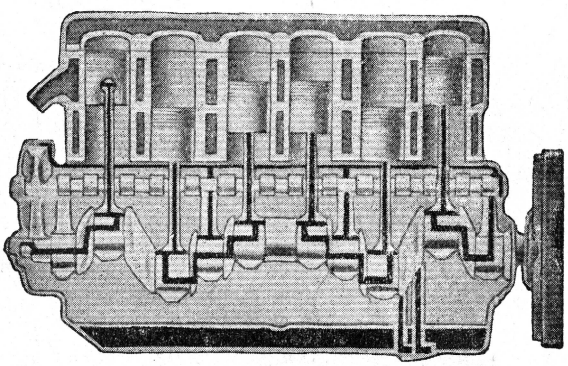




SPLASH SYSTEM



SPLASH & PRESSURE SYSTEM



PRESSURE SYSTEM

What the lubricating oil must do

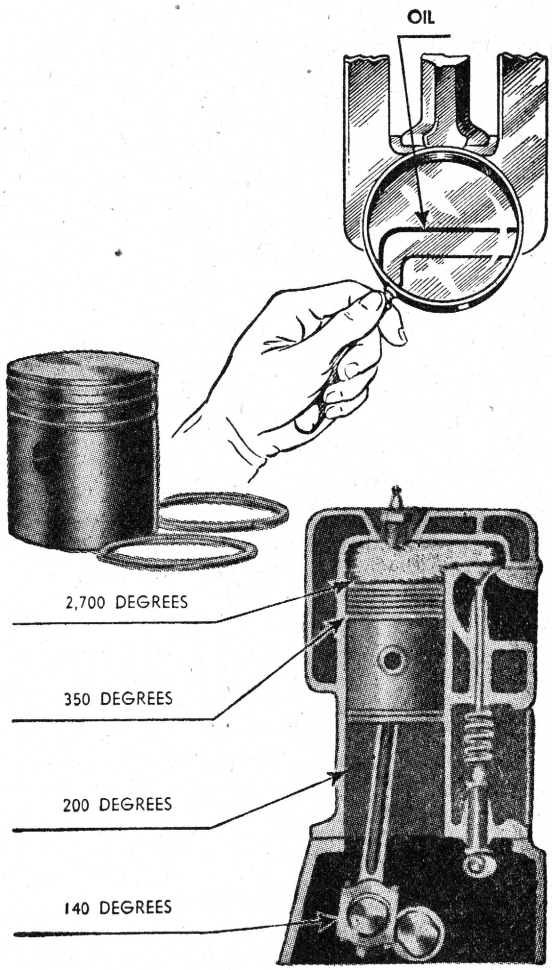
LOOK at any bearing surface and it appears as smooth as glass. Feel it and it couldn't feel smoother. But examine it under a microscope and it will be seen to be very rough.

When two metal surfaces of this nature are rubbed together without a film of oil between them, the resulting friction creates an ever-increasing amount of heat which is eventually sufficient to cause the fusing together of the two surfaces. This is what happens when bearing surfaces "seize-up."

Firstly, therefore, lubricating oil must provide a slippery film between the two moving surfaces and one which will withstand great pressures (and sometimes heat) and yet still maintain that lubricating film which will keep the moving surfaces apart, preventing metal to metal contact. Friction decreases the efficiency of your car.

Because it is lighter and conducts heat away better than cast iron, pistons are made of aluminium alloy. However, it expands more and therefore the pistons do not fit tightly in the iron cylinders when the engine is cold. Piston rings do, however, as they are made of iron. They prevent the compressed gases from escaping past the piston, which is "blow-by"; with consequent loss of power, and the "pumping" of oil up past the piston into the combustion chamber — a wasteful condition. This does happen when the cylinders, pistons and rings wear after much use and it can be detected (apart from loss of power, which *could* be due to other causes) by the continuous emission of blue smoke from the exhaust pipe.

Oil must therefore seal the piston rings to prevent "blow-by" and power loss. "Blow-by" causes a falling-off in performance and contaminates the crankcase oil with unburnt and partly burnt fuel (crankcase oil dilution). The oil also has the job of rapidly transferring heat away from pistons, big ends, main bearings and other moving parts, through to the metal of the engine block and thus to the cooling water, without breaking down. Some of the heat is carried back to the crankcase sump or oil tank and is dissipated there.



The lubricating oil must maintain its "body" at high operating temperatures so that it will still cushion all loads on bearings and other rubbing surfaces and prevent metal-to-metal contact and wear. Equally important, it must remain fluid at low temperatures to promote easy starting and circulate rapidly to all parts as the engine is warmed up, giving instant lubrication and protection.

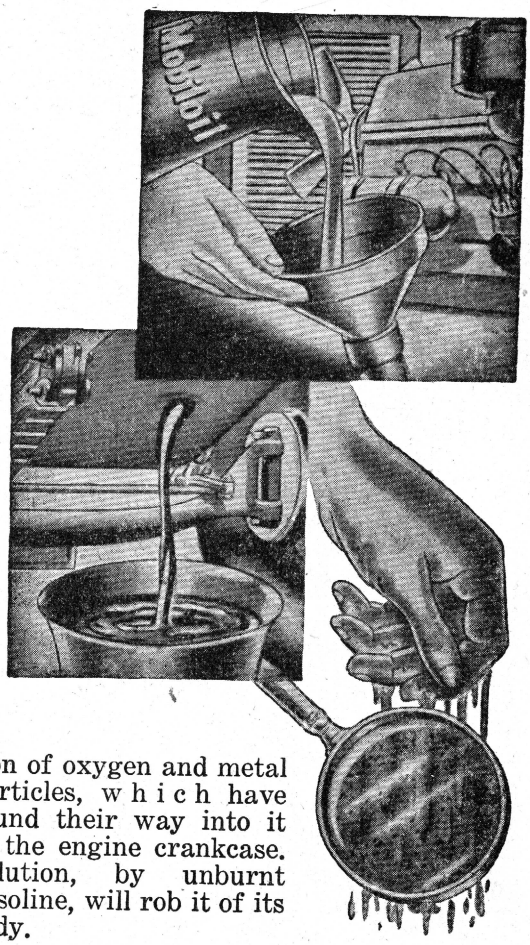
When the engine is warm its temperature varies at different points from 140°F. to over 1000°F. The cylinder wall temperatures may reach 350°F. Compare this with the boiling point of water, 212°F. It is obviously only a very high-grade oil which will lubricate satisfactorily at such high temperatures. That oil is Mobiloil.

Why you should change engine oil frequently

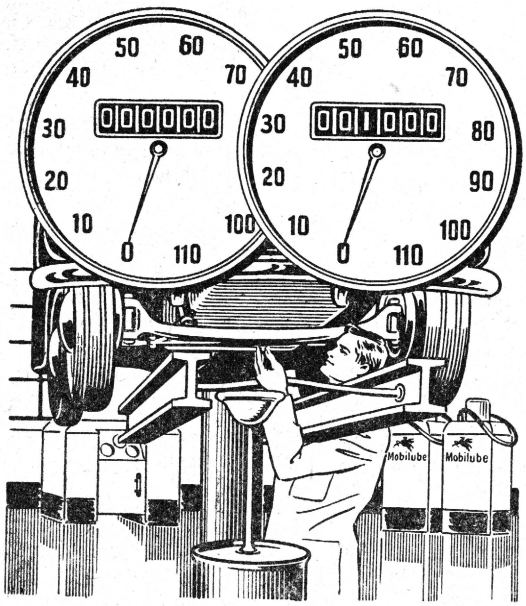
Yet another function of a good lubricating oil is to keep the engine clean and to prevent the formation of harmful deposits and sludges which can block oil ways and clog pump-screens. These are formed by minute particles of carbon from the fuel, combining with road-dust, grit and other contaminants in the crankcase. Detergent additives keep these otherwise harmful deposits encased by a thin film, preventing them from coagulating with other particles, and in harmless free suspension in the oil.

Oil must also resist oxidation, which is caused by the air oxidising the oil as the oil is sprayed and churned in the crankcase, particularly when operating temperatures are high. This is achieved by the addition of oxidation inhibitors. Anti-foam additives prevent the formation of persistent foam.

A CHANGE comes over the lubricating oil in the engine during a thousand miles of running. Although oil never wears out, it becomes unfit for use in an engine because of chemical changes due to absorption of oxygen and metal particles, which have found their way into it in the engine crankcase. Dilution, by unburnt gasoline, will rob it of its body.



Watch your speedo and change engine oil regularly every 1000 miles



The oil becomes lifeless, black, gritty, and unsafe for the engine . . . The next time you have your oil changed, ask your garage man to show you what he has drained off, or look at the filter element. Notice the difference between it and clean, fresh oil.

Dip your fingers in the used oil and rub them together. You can actually feel the grit. Engines never last as long as they should when they run on dirty oil.

To achieve correct lubrication you should have your oil changed every thousand miles. It's not much, when the cost of lubricating your car correctly is less than two per cent. of its yearly upkeep cost. Two per cent. is a small enough price for safety.

How the correct grade of oil is determined

Compiling the Mobiloil Chart of Recommendations really commences in the plants of the motor manufacturers.

Vacuum Oil Company's engineers study the characteristics of each new model as it is developed. Complete specifications are secured in chart form from the manufacturer's engineering department covering all features of the unit which have a bearing on its lubrication. Detailed blue prints of the lubricating system, and general design features are also obtained, sometimes with the actual parts where these are of special interest.

While the new model is being tested, data on its performance with various grades of oil are obtained.

All the information obtained either from the field or from any special test work is compiled and summarised. A complete analysis of the new makes and models takes place. The research engineers then describe in detail the tests conducted by them.

When all the facts bearing on the selection of the correct oil have been presented and discussed, the grades of Mobiloil having the required characteristics are determined. No time or expense is spared in any test work undertaken for this purpose. Thus the exact suitability and superior quality of Mobiloil are maintained.

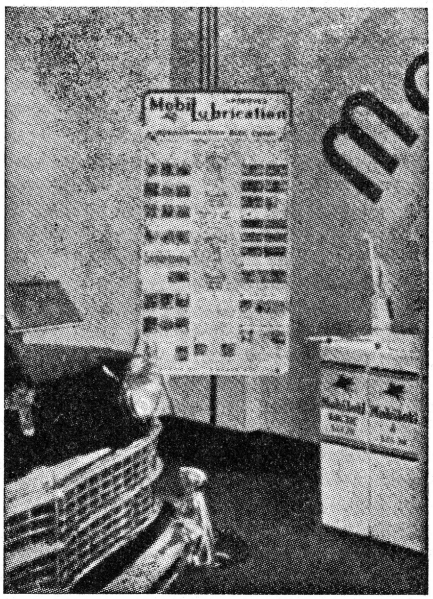
The latest Mobiloil Chart contains recommendations for lubricating all makes and models of cars over the past eight years. This Chart is by far the most complete and up-to-date guide to lubrication yet published.

More motor manufacturers recommend Mobiloil than any other lubricant.

When buying, always ask for Mobiloil, mention the grade, and see the Mobiloil trade mark on the container from which your oil is served.

Regular Mobilubrication will insure your car against wear and give you safety, comfort and freedom from trouble. Take your car to your local Mobilgas Service Station.

Never before in its 60 years of leadership in lubrication has even Vacuum been able to offer a motor oil with such outstanding qualities as Double Protection Mobiloil, which is available to motorists throughout Australia.



● *The Mobiloil Disc Chart of Recommendations . . . the greatest guide in the world to correct lubrication*

Mobiloil gives Double Protection because it provides:—

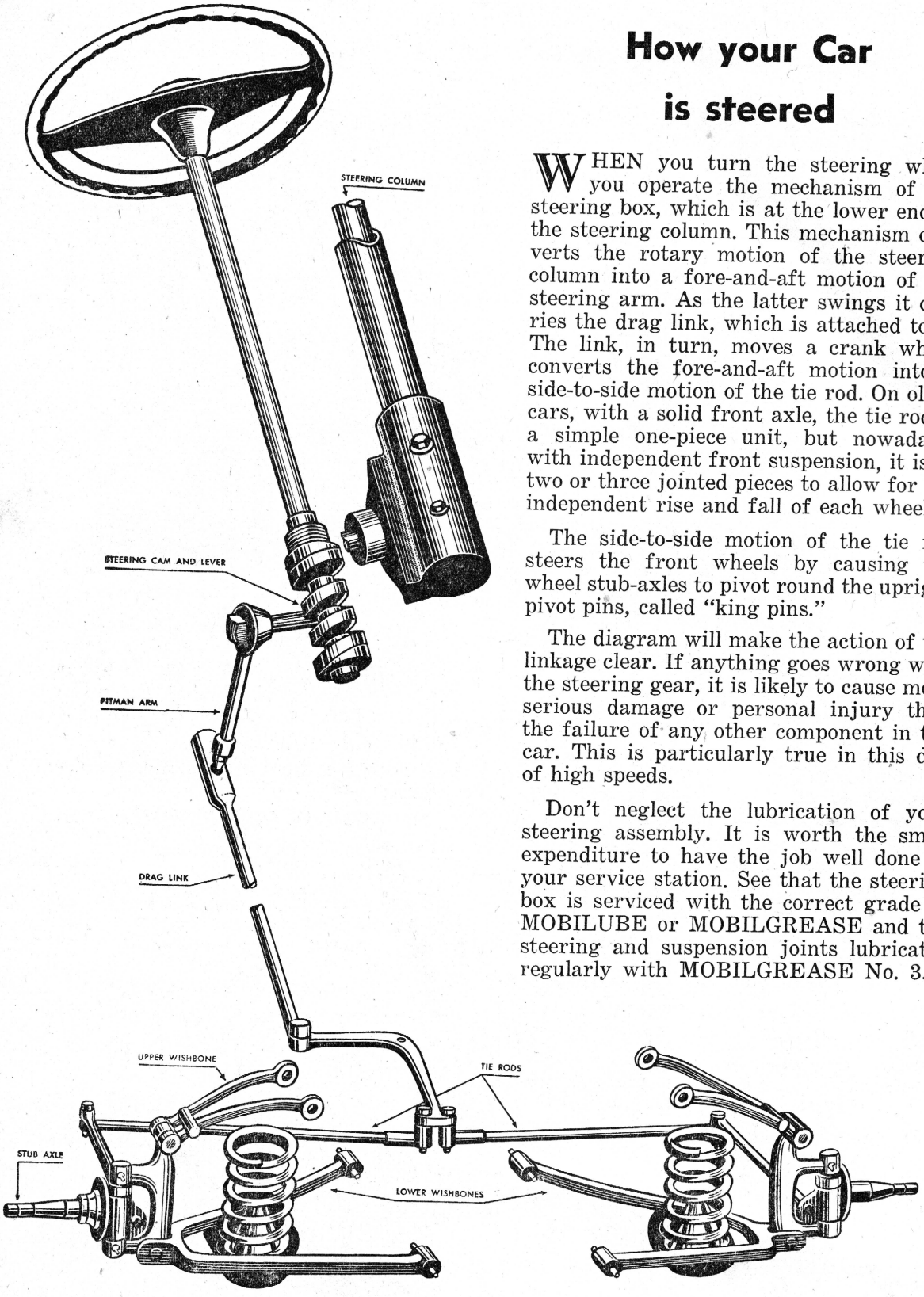
1. TWICE THE CLEANING ACTION.
2. TWICE THE PROTECTION AGAINST WEAR.

Every step from the selection of the base crude to the final compounding with tested special additives has been designed to make sure Double Protection Mobiloil meets all the needs of to-day's engines.

Its double-strength cleaning agent keeps valves, rings and pistons far freer of harmful sludge and varnish than formerly possible . . . and it has increased ability to cut friction by reaching and protecting tight-fitting engine parts more quickly and completely than ever before. New additives, also, reduce effectively corrosive wear in stop-and-go driving.

Double Protection Mobiloil adds years to engine life, reduces overhauls and repairs, and gives top economy.

How your Car is steered



WHEN you turn the steering wheel you operate the mechanism of the steering box, which is at the lower end of the steering column. This mechanism converts the rotary motion of the steering column into a fore-and-aft motion of the steering arm. As the latter swings it carries the drag link, which is attached to it. The link, in turn, moves a crank which converts the fore-and-aft motion into a side-to-side motion of the tie rod. On older cars, with a solid front axle, the tie rod is a simple one-piece unit, but nowadays, with independent front suspension, it is in two or three jointed pieces to allow for the independent rise and fall of each wheel.

The side-to-side motion of the tie rod steers the front wheels by causing the wheel stub-axles to pivot round the upright pivot pins, called "king pins."

The diagram will make the action of the linkage clear. If anything goes wrong with the steering gear, it is likely to cause more serious damage or personal injury than the failure of any other component in the car. This is particularly true in this day of high speeds.

Don't neglect the lubrication of your steering assembly. It is worth the small expenditure to have the job well done at your service station. See that the steering box is serviced with the correct grade of MOBILUBE or MOBILGREASE and the steering and suspension joints lubricated regularly with MOBILGREASE No. 3.

The action of the Clutch

IF you hold three coins, two half-pennies separated by a florin, between your fingers, you will find it easy to rotate one coin without turning another.

Squeeze the coins together and it's difficult to revolve one, without turning all three, even though the pressure is not more than a few pounds.

Now picture these discs held together under a pressure of three hundred pounds, and you will agree that it is extremely difficult to turn one without the others.

That's the principle of the clutch, the device which enables you to apply or release the power of the engine.

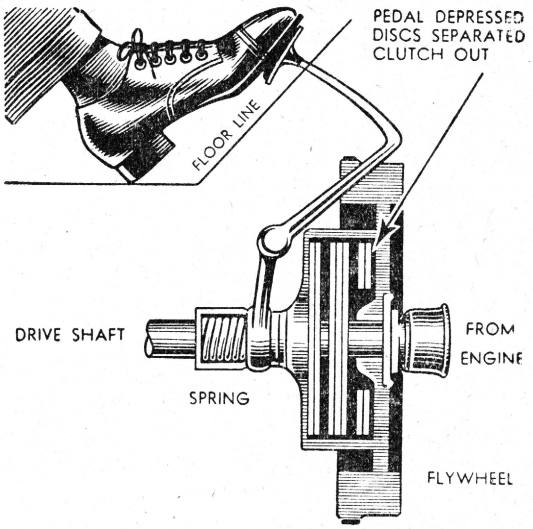
The clutch is composed of discs, some of which revolve with the engine, and others which turn with the gears.

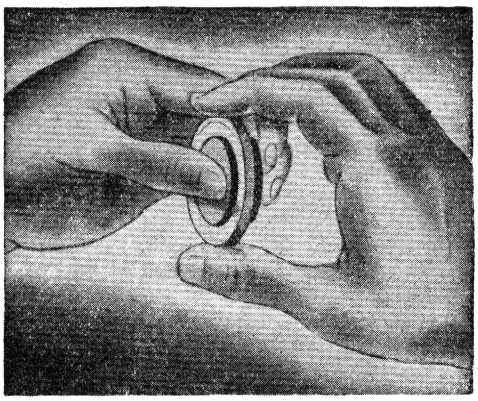
When you press on the clutch pedal the discs become separated. In other words, they are "de-clutched." When you allow the pedal to return to its normal position the clutch plates are clamped together again by strong springs.

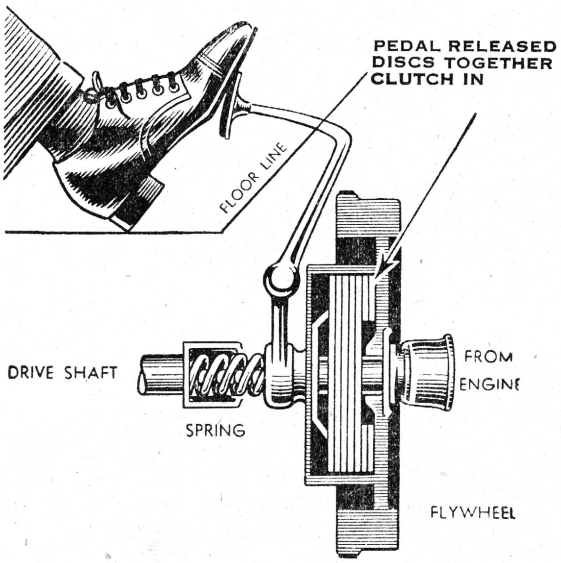
If you push the clutch pedal only part of the way towards the floor boards of the car, the various clutch discs run against each other. This is known as "slipping the clutch" and is very destructive to the surface of the discs. This is one reason why you should not rest your foot on the clutch pedal whilst driving.

Another type of clutch which is being fitted to a number of cars is the so-called "fluid flywheel." The fluid flywheel operates without the intervention of any clutch plates or other devices.

Incidentally, it's dangerous to attempt gear changing without using the clutch. If you try it, you may tear the teeth from the gears. Pushing in the clutch pedal removes the load and allows them to mesh safely and quietly.







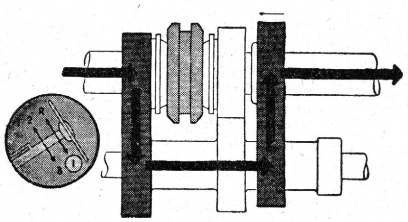
What happens when you change Gears

THE gear box is called "selective" because you may select the gears which transmit the engine's power to the rear wheels.

FIRST GEAR

When you change into first or "low," you engage a set of gears which transmit great power to the wheels through fast engine speeds.

First or "low" gear is a slow, but powerful speed. It usually operates on a 3-to-1 ratio. In other words, the crankshaft revolves three times to one turn of the driveshaft.

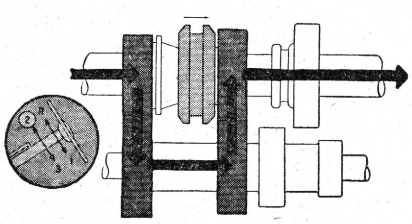


Your car moves ahead at proportionately low speed — but with great power. First gear is usually employed in starting your car.

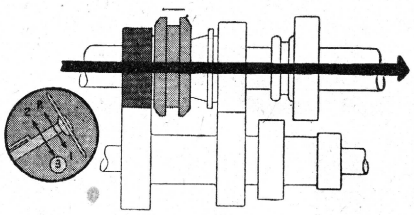
SECOND GEAR

When you change into second, you engage other gears which increase your car's forward speed, but decrease its pulling power.

Second gear sacrifices power in favour of speed. It usually operates on an approximately $1\frac{3}{4}$-to-1 gear ratio.



THIRD GEAR

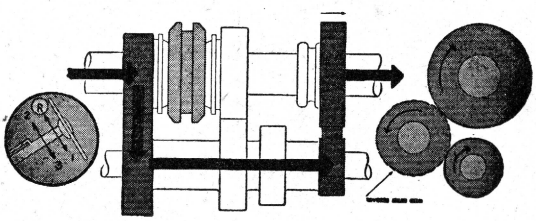


PERHAPS you have wondered why third or top gear is not so noisy as the first or second gear. The reason lies in the fact that in high gear you are not driving through a set of gears.

Third or top gear connects the crankshaft with the mainshaft in the gear box, as though it were one shaft. As a result, one turn of the crankshaft equals one turn of the driveshaft. It's a 1-to-1 ratio.

High gear is the fastest, but least powerful, of all the gears in the gear box. Some cars have a fourth speed, which is even faster than third. When four speeds are used there is a readjustment or balance of gear ratios.

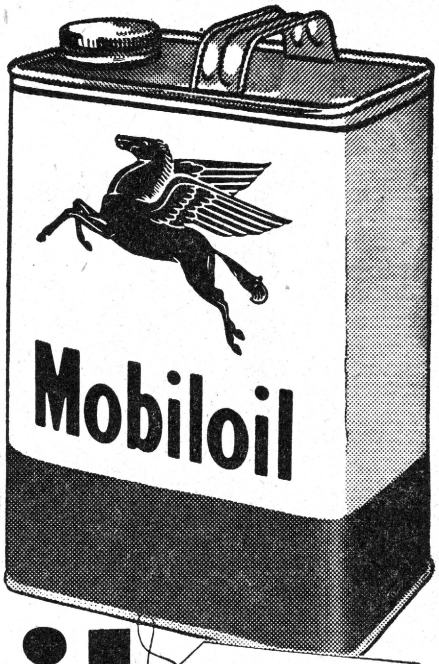
REVERSE GEAR



Reverse gear does not make the engine run backward, as some people may believe it does.

If you watch two gears revolve against each other, you will see that they turn in opposite directions. You take advantage of this principle and put it to work in driving your car backwards.

Reverse gear is the slowest, but most powerful of all the gears in your transmission.



Double Protection

Mobiloil

at no increase in price

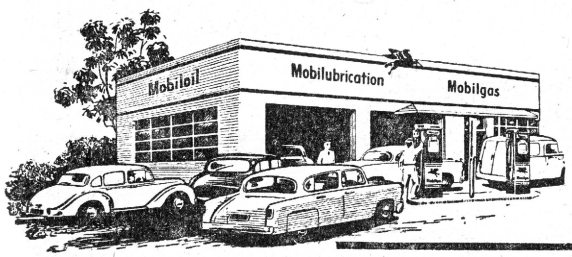
Double Protection for Your Engine

1 TWICE THE CLEANING ACTION!

- Double-strength cleaning agent keeps valves, rings and pistons far freer of harmful deposits and varnish than formerly possible.
- New engines operate longer at top power – old engines take on new life!
- YOU get smoother engine performance – more power – improved mileage.

2 TWICE THE PROTECTION AGAINST WEAR!

- Increased ability to cut friction – by reaching and protecting tight-fitting engine parts more quickly and completely than ever before.
- New additives in **Mobiloil** effectively reduce corrosive wear in stop-and-go driving.
- YOU add years to engine life – reduce overhauls and repairs – assure top economy!



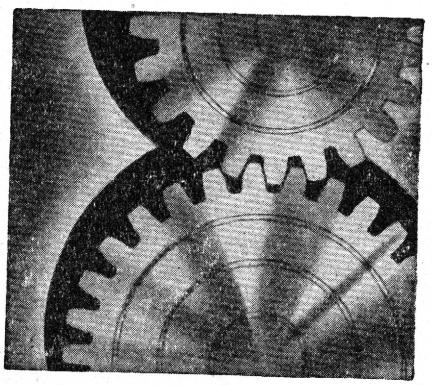
Why accept anything less?

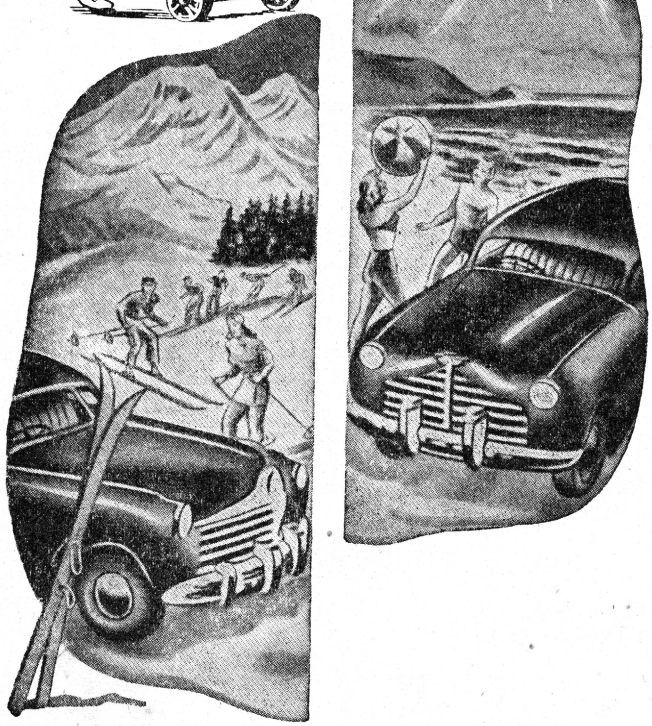
Change now

at your local Mobilgas Service Station

VACUUM OIL COMPANY PTY. LTD. (Inc. in Aust.) M 558

To ensure quiet-running gears





THERE are usually eight gear wheels in the gear box if it contains three forward speeds. These gears are made with a number of teeth on them like those on a watch wheel.

When meshed, the teeth of one gear engage the teeth of its mate, and exert thereon the necessary leverage to make the gear wheel revolve.

Transmission gears work together under tremendous pressure. At times they carry a load of more than two tons.

A meagre knowledge of mechanics will tell you that gears must not come together without a lubricant between them. If they do, they will quickly wear away and become noisy.

The purpose of the lubricant is to prevent metal-to-metal contact of the teeth, and to cushion the shock in the same manner as rubber tyres cushion shock.

Mobilube C90, C140, C250, GX90 and GX140 have been developed especially for gear lubrication. When used as recommended on the Mobiloil Chart these grades will give excellent results.

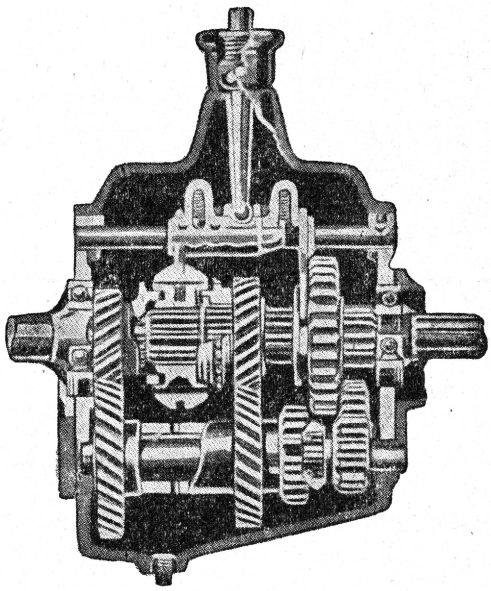
They will flow between gears and lubricate the close fitting bearings. It is easy to change gears in winter when you use these recommended lubricants in your gear box.

Your gear box should be flushed every 5000 miles to remove the old oil and the dust and dirt which have found their way into it. Your garage man will do this job for you.

With gears of the hypoid type, such as are found in many crown wheel and pinion assemblies, a high degree of sliding occurs between the teeth, and "extreme pressure" lubricants are necessary to resist scoring. MOBILUBE GX90 and GX140 are such lubricants, and are referred to in the chapter on HYPOID REAR AXLE.

Synchro-mesh Gear Boxes and special Transmissions

GEAR changing, which has been the bugbear of many motorists, becomes a simple operation when synchro-mesh transmission is in use. Unlike the ordinary type of gear box where the gears themselves are moved along the splined shaft, the gears in most synchro-mesh gear boxes are always meshed as shown at right. The gear box shown diagrammatically below has an overdrive gear, and synchro-mesh on second and top gears.

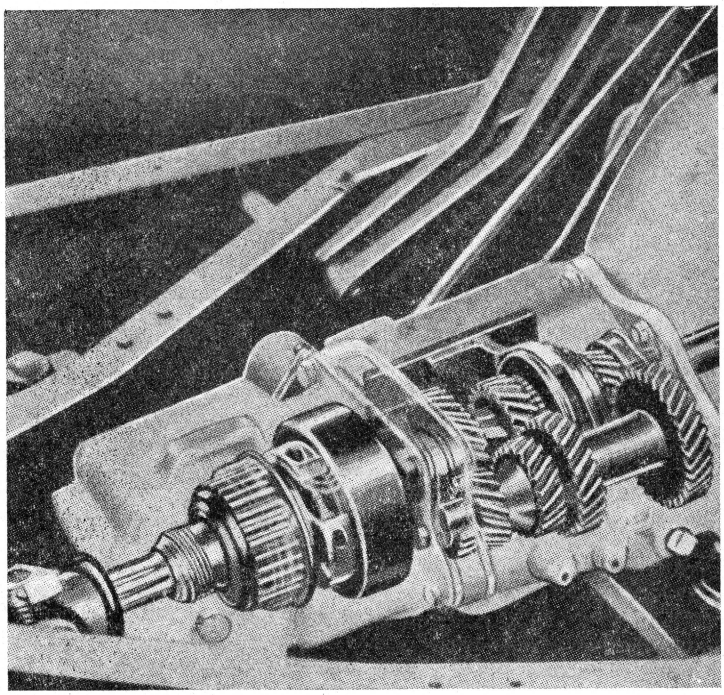


The engagement of the drive is made by means of, first, a small metal cone clutch and then a "dog" engagement similar to the top gear engagement on the ordinary type of gear box.

The first portion of gear lever movement engages the small metal clutch thus making the "dog" and the gear turn at the same speed.

Continuing the gear lever movement to the full "in gear" position, completes the "dog" engagement and the small metal clutch takes no portion of the driving load. Synchro-mesh gears ensure quiet gear changing.

Gear changing at once loses all its terrors and a novice can learn the art of "changing" very quickly.

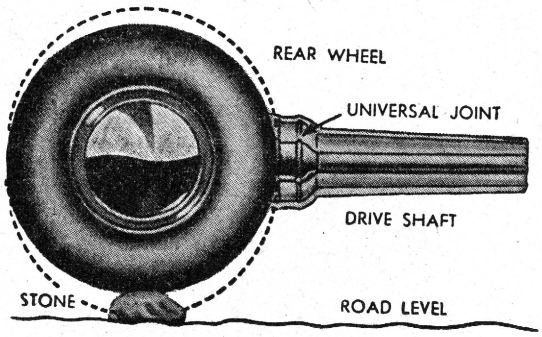


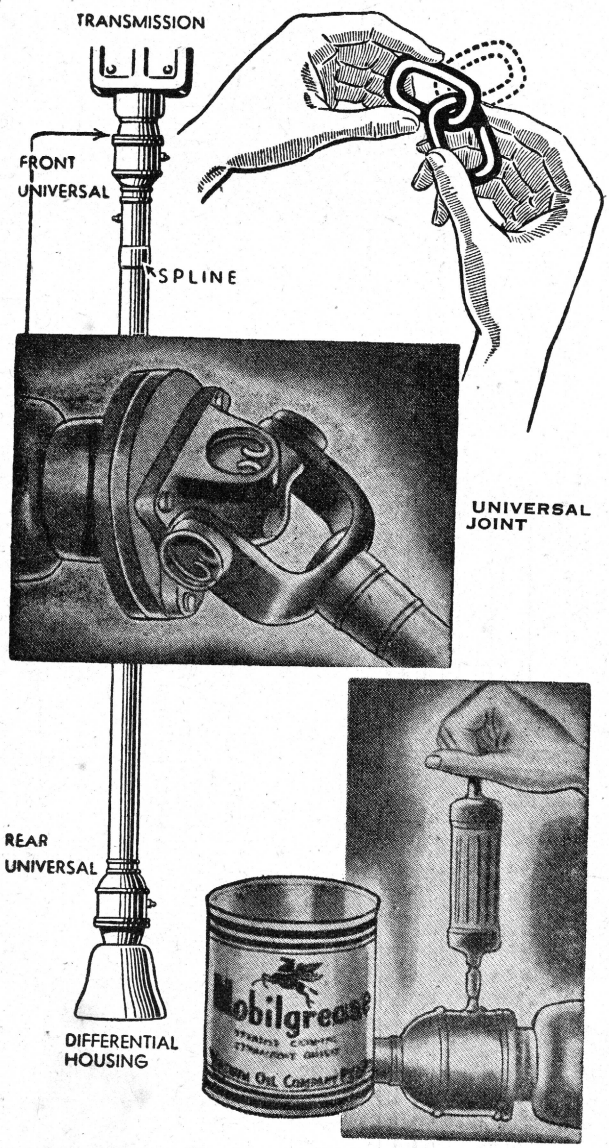
Certain cars are fitted with what might be termed a two-speed auxiliary gear box at the rear of the main gear box. The purpose of this unit which is known as the overdrive is to give the effect of a still higher gear than the normal top gear.

Thus when cruising at high speed on level road this overdrive if brought into operation will lower the engine speed for a given car speed and for this reason it is usually claimed to show a reduction in fuel consumption.

Overdrive gears are no more heavily loaded than ordinary gear boxes but they may have small passages and holes through which the lubricant must circulate to reach all the gears and bearings. There is also sometimes an over-running or free-wheeling clutch which must act freely under all temperatures.

The Universals . . . . .





So far we have followed the transmission of the power of the engine through the clutch and into the gear box, where it may be changed to a more useful form as and when required.

The power now leaves the gear box, and is relayed to the rear end through a universal joint and driveshaft.

If you watch the rear wheels on the car ahead, you will notice that they bounce up and down.

This bouncing is inevitable, due to unevenness in the road, but the flow of power through the driveshaft is made to conform to it through the flexibility of universal joints.

A universal joint is a flexible coupling which permits the driveshaft to turn at an angle. It works like the links in a chain.

To prevent damage to the driving units, every car has at least one universal joint (some cars have two), fastened at the front or both ends of the driveshaft.

Lubricating the Universal Joints

Most universal joints are now of the roller or needle bearing types which are packed with lubricant and require additional lubrication only when dismantled at periods of up to 10,000 miles. For these joints Mobilgrease No. 5 or Mobilgrease No. 3L should be used depending upon the type of sealing arrangement incorporated in the joint and for this reason, it is best to follow the makers' instruction book as to the type of lubricant required.

Mobilgrease No. 5 applied every 5000 miles will properly lubricate universal joints of the "grease type."

Don't attempt to do this work yourself. It's a messy, disagreeable job, at best. Let your local Mobilgas Service Station do it for you. They have the equipment to do the job correctly.

The Differential helps you turn a corner

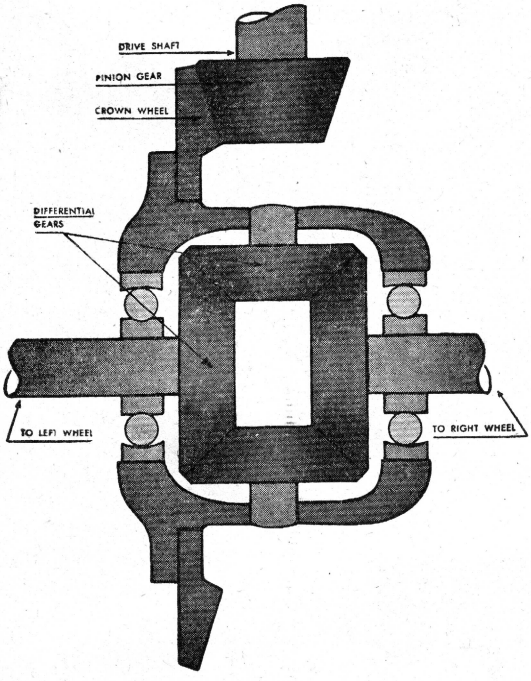
AT the beginning of this book, we saw that the rear axle assembly consists of two units which work as one. One of these units must direct the flow of power at right angles to the driveshaft. It does this through two gears; the power goes in at one angle and comes out at another.

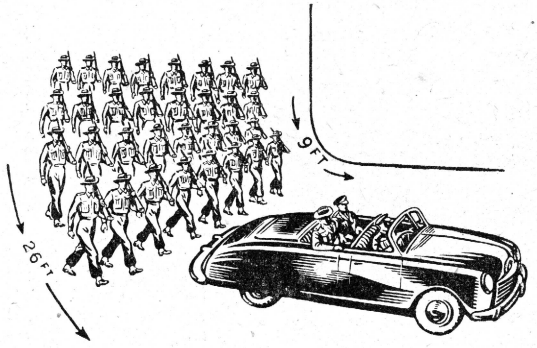
If you have watched a squad of soldiers make a turn, you have noticed that the pivot man marches but a few feet compared to the man at the outer end of the line. The pivot man takes short steps or marks time, depending on the angle of the turn.

The differential executes similar movements in your car. It drives the outside rear wheel faster and further than the inside wheel when rounding a turn.

The loads carried by the differential gears are not unlike those of the gear box. They demand a lubricant which will prevent wear. Consult the Mobiloil Chart for the correct grade.

Since it's almost impossible to keep dirt out of the rear axle housing, the lubricant should be changed every 5000 miles. Your Mobilgas Service Station will do this for you and flush out the housing at the same time.





Filling a differential housing requires experience and special servicing equipment. Care should be taken that too much oil is not added, for it may work along to your rear wheel brakes and prevent them from holding properly.

The driving axles, which actually turn the wheels, are fitted with bearings contained within their housings. These bearings must be lubricated every 5000 miles. Mobilgrease No. 5 will keep them turning freely.

GIVE YOUR CAR EXTRA PROTECTION

Your car is a miracle of power, precision and performance—a fine mechanism which needs complete and regular lubrication, the vitally necessary care that assures long, economical, carefree car life. Play safe and avoid neglect and needless expense. Simply drive up to your local white Mobilgas Service Station for genuine, safe, sure and complete

Mobilubrication Service

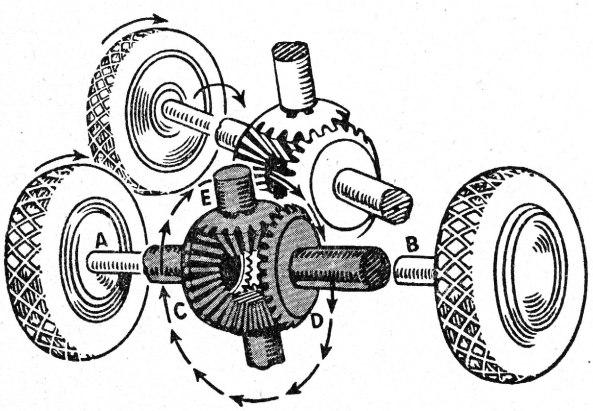
Look for the Flying Red Horse

How the Differential works

NOW we'll show you how the differential works. As you have already seen, when you turn a corner, the outside rear wheel must cover a greater distance than the inside rear wheel. So it would be useless to have both wheels rigidly fixed to a common axle because, to get round the corner, one wheel would have to spin while the other dragged.

The differential solves this problem. Its first essential is that each wheel must have a separate axle. The second essential is that these two axles must be connected in such a way that they can rotate at different speeds. This diagram shows how it is done.

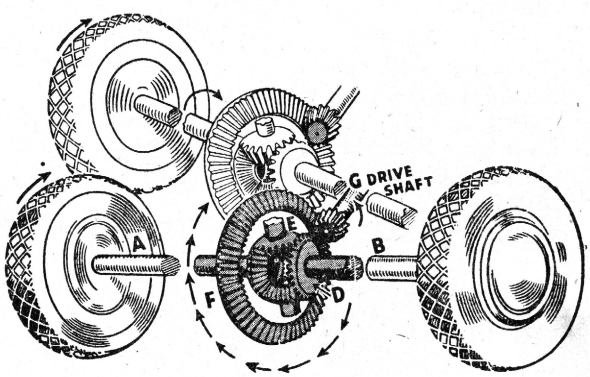
Let us break the axle into two "half-shafts" A and B and fix a gear wheel C on to A and a similar gear wheel D on to B.



Then if we fit a floating gear wheel E which meshes with C and D, let us see what happens when we turn the road wheels. If we hold the right hand wheel so that it cannot turn and then turn the left hand wheel, the gear wheel C will turn. Since it is engaged with the gear wheel E, E must also turn. But the gear wheel D must remain stationary because we are holding the right hand wheel.

Summarizing, A must turn, therefore E must turn, while D remains stationary. The only way that this can happen is for the wheel E to revolve on its own axis and, at the same time, roll bodily round the periphery of the stationary gear wheel D, as shown by the arrows on the dotted track.

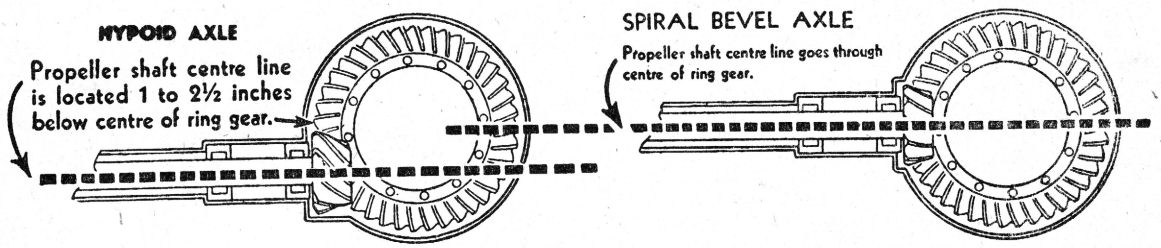
Thus when one road wheel has to turn faster than the other, the gear wheel E compensates for this by turning on its own axis and rolling round the periphery of the gear wheels C and D—this is the principle of the differential. All that remains now is to connect up the drive shaft of the car to this device. Obviously the drive shaft must divide its attentions equally between the shafts A and B. It cannot be fixedly attached to either. Therefore we must transmit the drive through the gear wheel E, by turning it bodily round and round. The crown wheel does this job. Look at the diagram.



The crown wheel F is driven directly from the propeller shaft G. F is fitted *loosely* on the shaft A, and it carries the little stub-axle on which E rotates. F can only drive the left "half shaft" through the gear wheel E. It can also only drive the shaft B in the same way, and, if you go back to the first diagram you will remember that the compensating effect of the gear wheel E enables the two rear wheels to be driven at different speeds.

You will be able to follow the working of the differential quite easily, so long as you remember that the gear wheel E is the only connection between the drive shaft and the rear wheels.

Hypoid Rear Axle



DURING recent years there has been a tendency for the majority of motor manufacturers in various parts of the world to fit hypoid rear axle drives to passenger cars. This tendency has been due, firstly to the demand for lower and lower bodies, which made it necessary to lower the propeller shaft, and the hypoid axle, with the pinion shaft entering the housing below the centre line of the crown wheel, made this possible. Secondly, the increased loads on rear axle gear teeth, due to the constant increase in horsepower output of engines during the past few years, made further development necessary without increasing gear sizes.

The tooth design and structure of hypoid gears offers as much as 50 per cent. greater tooth strength than spiral-bevel gears of the same size. Thirdly, due to the sliding action of the teeth, hypoid gears operate much more quietly than spiral-bevel gears.

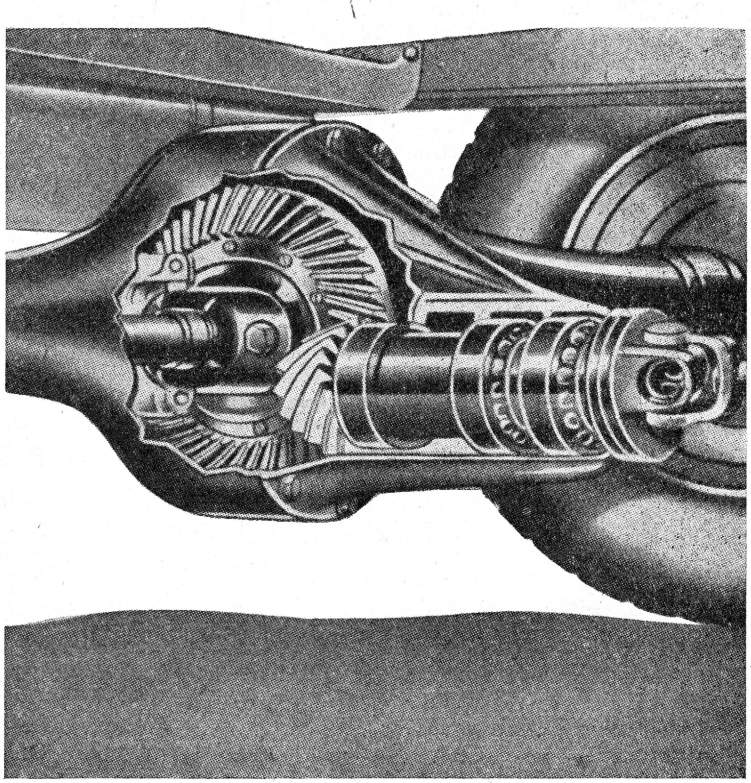
Axles fitted with hypoid gears may be recognised by the position of the propeller shaft where it enters the axle housing. It is considerably below the centre of the axle (see illustration).

Hypoid gears are more difficult to lubricate than spiral-bevel axles because the rubbing speed between the gear teeth is much greater. The combination of speed and pressure is too great for straight mineral gear oils. To prevent welding and scoring of the teeth, "extreme pressure" lubricants must be used.

To keep the protective value of the lubricant always above a safe level and to prevent excessive thickening and possible channelling, regular draining and renewal of the supply every 5000 miles are essential. Flush only with Mobil Flushing Oil.

Mobilube GX 90 and GX 140 have been especially developed for use in this type of rear axle. They are specially compounded to give the utmost in protection without causing complaints due to rapid thickening or excessive chemical reaction.

Before the introduction of Mobilube GX 90 or GX 140 to a rear axle the unit should be drained while hot and flushed with Mobil Flushing Oil.



Well lubricated Springs give greater riding comfort

ALTHOUGH present-day design favours independent front suspension, most cars still use non-independent rear springing, with leaf springs.

These consist of layers of leaves bolted together with metal clips. These leaves flex back and forth like an archer's bow when the wheels of the car hit a bump in the road. Before the introduction of shock absorbers, the leaves of the spring were left dry in order to assist in the absorption of the shock when the leaves slip one on top of the other.

Shock absorbers are now fitted to cars to help absorb the large shocks, and also to stop the bouncing which tends to persist after the road bump has been passed.

Shock absorbers are generally of the hydraulic type, although friction type shock absorbers are also used. Hydraulic shock absorbers are filled with oil which acts as the shock absorbing medium.

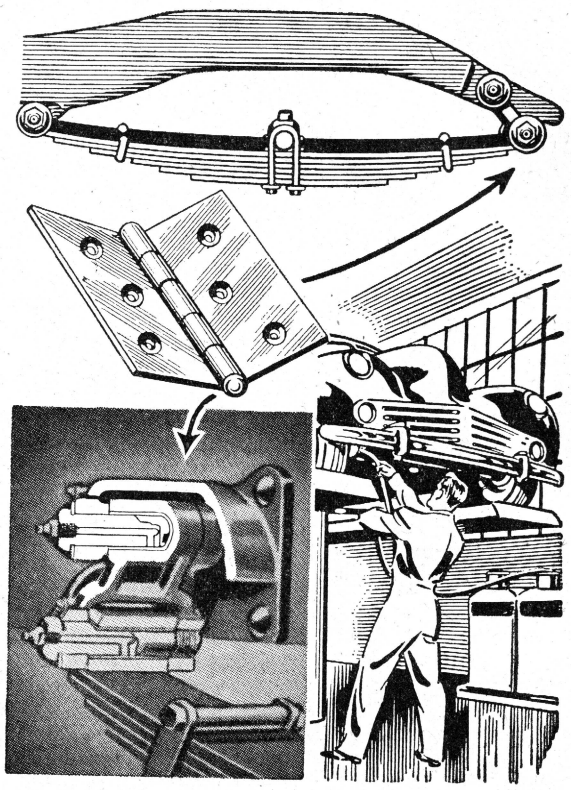
As springs of cars fitted with shock absorbers are not intended to absorb the major road shocks unaided, spring leaves should be lubricated to enable them to slide freely one over the other. Uncovered springs should be cleaned with a wire brush and sprayed with Mobil Spring Penetrating Oil every 1000 miles.

Independent Suspension Systems

Cars fitted with independent suspension systems usually have coil springs as part of the suspension system. These require no lubrication normally, although in some cases the spring is enclosed in a housing full of lubricating oil.

Special products are available for the lubrication of different types of springs.

The use of Gargoyle Grease Graphited No. 3 every 5000 miles is recommended for all covered springs except those fitted to Chrysler cars. Chrysler springs work better when lubricated with a graphite free lubricant like Mobilgrease No. 3L.



When you hit a bump, the springs straighten out and become "longer," therefore they are attached to the frame with spring shackles. Shackles permit the springs to extend and shorten as conditions require . . . like a door hinge.

Springs are anchored in their shackles with shackle bolts. These bolts are equipped with lubrication fittings, and should be serviced regularly for easy riding.

Mobilgrease No. 3 is recommended for spring shackle bolts. This is a grease noted for its lasting qualities, in addition to its many other features.

Your local Mobilgas Service Station has special equipment for greasing your car. They know the lubrication requirements and locations of all the points. It is a wise plan to let them do this work.

The Brakes

SOME systems operate hydraulically. In other words, they rely on pressure other than direct mechanical linkage to press the brake shoes against their drums.

It is claimed that the brakes and the clutch are the only units in which friction works to an advantage. This may be true. However, it does not hold with regard to the brake *fittings*. These must be lubricated frequently.

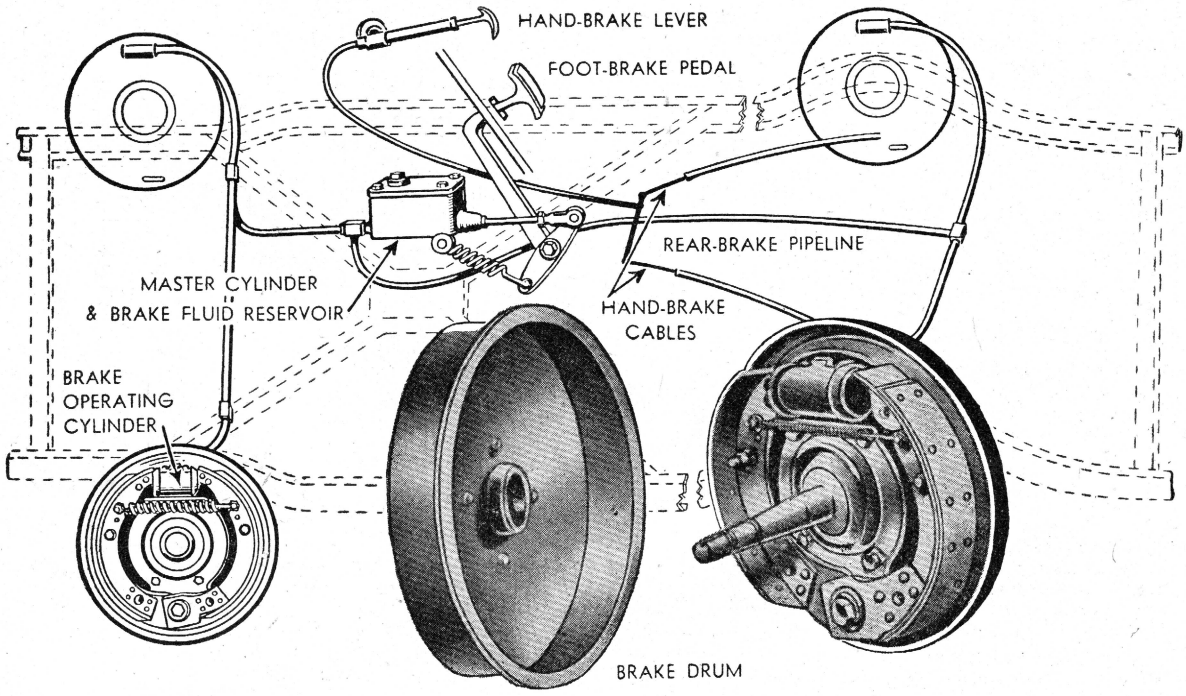
Let your Mobilgas Service Station lubricate these fittings with Mobilgrease when you are having the oil changed in the crankcase. A little precaution in this respect may prevent a serious accident.

The principle of operation of hydraulic brake systems is that when the brake pedal is depressed it pushes a piston along a cylinder filled with brake fluid. An oil reservoir is located on top of the brake cylinder and must always be kept full so as to prevent any air getting into the system, which would be liable to prevent the brakes from operating. This cylinder feeds a pipe line for each wheel. At the brake end of each pipe line is another cylinder in which a piston is moved by the incoming fluid. This piston operates the brake shoes and brings them into contact with the brake drum. It will be seen that the operation of such a system depends on the fact that brake fluid, like all liquids, is almost incompressible and acts like a flexible column inside the pipe line.

Bleeding the Brakes

One of the jobs which has to be done occasionally on hydraulic brake systems is called "bleeding." This entails removal of air bubbles which have found their way into the fluid. Bleeding merely involves the disconnection of each pipe line at the brake end in turn and operating the brake pedal until the air bubbles are expelled from the system. The fluid thus lost must, of course, be made up in the master cylinder reservoir. This procedure will restore the firm action of the pedal.

The main advantage of a hydraulic braking system is that it is bound to exert equal effort at all four brakes whereas with mechanical brakes, regular adjustment is required to achieve this result.



Description of Automotive Lubricants

ENGINE OILS

The Mobiloil range of engine oils is manufactured from the world's finest crudes which produce lubricating stocks. These are processed by latest atmospheric and vacuum distillation units as well as being clearosol refined, using double solvents.

To this base are blended additives which make Mobiloil outstanding for the lubrication of the gasoline engine under all operating conditions.

A detergent additive protects the engine by always keeping it clean. An oxidation and corrosion inhibitor prevents the formation of oxidation products and ensures that there will be no corrosion due to acidity. Mobiloil also contains an anti-foamant additive which means an "air free" lubricant under all conditions of service.

Mobiloils are marketed in the following grades:

Mobiloil 10W	**SAE 10W**
Mobiloil Arctic	**SAE 20-20W**
Mobiloil A	**SAE 30**
Mobiloil AF	**SAE 40**
Mobiloil BB	**SAE 50**
Mobiloil D	**SAE 50**

(This product is specially developed for Motor Cycles and sports car engines)

Mobiloil R	**SAE 50**

(is a castor base oil for racing engines)

On account of the heavier fuel used in Diesel engines, it is necessary to have an engine oil with higher detergent properties as found in the Delvac Series Oils, which are marketed in the following grades:—

Delvac Oil 910	**SAE 10W**
Delvac Oil 920	**SAE 20-20W**
Delvac Oil 930	**SAE 30**
Delvac Oil 940	**SAE 40**
Delvac Oil 950	**SAE 50**

Mobiloil Two-Stroke — SAE 30 is recommended for engines which are lubricated with the Petroil system of lubrication. Reference to the Mobiloil Chart or your Instruction Book will give the ratio of gasoline to oil.

GEAR LUBRICANTS

A complete range of gear lubricants for both normal and Extreme Pressure lubrication requirements are covered by the Mobilube Series. All these grades are blended from rich cylinder stocks and have high lubricating value. They all contain an oxidation inhibitor and an anti-foamant additive. The Extreme Pressure grades also contain an Extreme Pressure additive and are recommended where tooth pressures are high, such as in hypoid gears. The straight Mineral Gear Lubricants are:—

Mobilube C 90	**SAE 90**
Mobilube C 140	**SAE 140**
Mobilube C 250	**SAE 250**

The Extreme Pressure grades are covered by:—

Mobilube GX 90	**SAE 90**
Mobilube GX 140	**SAE 140**

AUTOMOTIVE GREASES

Mobilgrease No. 3L: For chassis lubrication, front wheel suspensions and certain universal joints. It is semi-fluid aluminium base grease, highly resistant to the washing action of water and will withstand shock loads.

Mobilgrease No. 3 has similar characteristics to Mobilgrease No. 3L, but is slightly heavier in body.

Mobilgrease No. 5: A soda soap base grease which will resist the effects of high temperature and is recommended for wheel bearings and grease type universal joints.

Mobilgrease No. 6: For water pumps, as it is highly resistant to water and will still lubricate if the water boils.

Gargoyle Grease Graphited No. 3: Used for the lubrication of spring leaves when the springs are fitted with a metal cover.

AUTOMOTIVE SPECIALTY PRODUCTS

Mobilfluid 200 is recommended for all hydraulic transmissions.

Mobil Shock Absorber Oils Nos. 1 and 5, for all types of Shock Absorbers requiring a fluid medium.

Mobil Upperlube is a specially refined mineral oil containing additives for upper cylinder lubrication. Can be used either mixed with the gasoline or through lubricators.

Mobil Spring Penetrating Oil is used for spraying on the outside of leaf springs not fitted with gaiters.

Mobil Flushing Oil for flushing all types of transmissions, particularly those using Extreme Pressure Lubricants.

Mobil Rubber Parts Lubricant is used for preventing squeaks in natural rubber bushes fitted to shackles and shock absorbers.

BEST PROTECTION FOR YOUR INVESTMENT

For business or pleasure, your motor vehicle represents an important investment worthy of the best care and maintenance service you can secure for it.

Naturally, you will seek efficient service that will give you safe, economical and trouble-free motoring . . . and, naturally, you will want friendly service that will make you feel your purchase is receiving individual attention from skilled operators who have a personal interest in the welfare of your investment.

Throughout Australia hundreds of enterprising Mobilgas Dealers offer you

- Products of the very highest quality available at the lowest cost.
- Better maintenance service carried out by skilled operators trained at special schools conducted by the Vacuum Oil Company.
- Friendly, personalised attention for you and your vehicle.
- Stations that are attractive, clean, and easy to enter and leave.

Select your neighbourhood Mobilgas Service Station under the sign of the Flying Red Horse. It will pay you to trade there and to make it your motoring headquarters. When touring, or away from home, you can be sure of the service and products you want when you buy at the sign of the Flying Red Horse. *Mobil Road Maps and Guides are available to you from your local Mobilgas Service Station.*

ENGINE LUBRICATION

Summer Recommendations are for normal conditions of load and speed. Where Units are operated continually under conditions of severe overloading, extreme speed, steep grades or high atmospheric temperatures, use the next grade of Mobiloil with a higher S.A.E. number.

Winter Recommendations apply for the months of June to August, inclusive, for the whole of Australia except for a portion of the continent lying North of an imaginary line drawn through Rockhampton, Hughenden (Queensland) and Carnarvon (Western Australia), where winter recommendations need not be followed.

CRANKCASE DRAINING: Every 1000 miles drain the crankcase when hot and replenish with fresh oil of the correct grade as recommended. If engine requires flushing, use engine oil.

RUNNING-IN NEW OR RE-BORED ENGINES: Mobiloil Arctic is recommended for the first 2000 miles of operation in all new and re-bored engines. Change the oil after the first 250 miles, then at 1000 and 2000 miles, after which the normal recommendation should be followed.

GEAR BOX AND REAR AXLE LUBRICATION

The gear box and rear axle recommendations apply for operation under normal conditions in all seasons.

For abnormally low atmospheric temperatures, or when temperature conditions cause difficulty in gear changing, Mobilube C90 or GX90 should be used, where the normal summer recommendation is respectively C140 or GX140. Recommendations for Mobilube C90 or GX90 apply for both summer and winter conditions.

Draining and Refilling: Check lubricant level every 1000 miles and top up. Drain when hot, flush with Mobil Flushing Oil and refill transmissions and rear axles every 5000 miles.

UPPER CYLINDER LUBRICATION

For upper cylinder lubrication Mobil Upperlube is recommended. Mobil Upperlube is suitable for use in all types of upper cylinder lubricators or can be mixed with gasoline in the proportion of 2 oz. Mobil Upperlube to each 4 gallons of gasoline except during the running-in period when the proportion of Mobil Upperlube should be 2 oz. to two gallons of gasoline.

ABBREVIATIONS USED IN THE FOLLOWING CHARTS

Arc	means	Mobiloil Arctic
A	„	„ A
AF	„	„ AF
BB	„	„ BB
D	„	„ D
C90	„	Mobilube C 90
C140	„	„ C 140
GX90	„	„ GX 90
GX140	„	„ GX 140
930	„	Delvac Oil 930
920	„	„ „ 920
MF200	„	Mobilfluid 200

MOBILOIL CHART OF RECOMMENDATIONS

CARS	Engine			Gear Box		Rear Axle	
	Sum.	Win.	Qts.	Grade	Pints	Grade	Pints
A							
A.C. (Petite 3 Wheeled) 1955-52 (†Petroil System)	*TS	*TS	†	BB	—	C140	½
Ace, Acedes 2 Litre 1955-46	BB	A	7	BB	3	GX90	3
ALFA-ROMEO 4 cyl. 1900 cc. 1955-51	AF	A	6	GX90	3	GX90	4½
6 cyl. 2500 cc. 1953-47	AF	A	8	C90	4¼	C90	3¼
ALLARD Model Z 1955-52	Arc	Arc	4	GX90	2	GX90	2½
Model C 1955-52	Arc	Arc	3¾	GX90	2	GX90	2½
1952-50	A	Arc	4	GX90	2	GX90	2
1949-46	A	Arc	4	C140	2	GX140	2
ALVIS 3 Litre 1955-51	Arc	Arc	6	A	3	GX90	2¼
Fourteen 1950-46	A	A	6	A	4	GX90	3
ARMSTRONG SIDDELEY—							
Sapphire 1955-53	A	Arc	5	A	5	GX90	2½
Automatic Transmission	—	—	—	MF200	18	—	—
Pre-selective Gear Box	—	—	—	A	6	—	—
18 h.p. 2.3 Litre 1954-50, 16 h.p. 2 Litre 1949-46 Syn. Gear Box	A	Arc	5½	BB	3½	GX90	2½
Pre-selective Gear Box	—	—	—	A	4	—	—
ASTON MARTIN 2½ Litre 1955-51	A	Arc	7½	C90	3	GX90	2
2 Litre 1950-46	A	Arc	6	A	2½	GX90	2
AUSTIN A90 Westminster 1955	A	Arc	6	A	4	GX90	3
A40, A50 Cambridge 1955-54	A	Arc	3½	A	4½	GX90	2
A30 1955-52	A	Arc	3	C90	2¼	GX90	1¼
A40 Somerset 1954-52	A	Arc	3½	C90	3	GX140	2¼
A40 Devon 1952-48	A	Arc	3¾	C90	2	GX140	2¼
A70 1954-49; A90 1952-49	A	Arc	6	C90	3	GX140	2¾
A125, A135 1954-48	A	Arc	8	C90	6½	GX90	3
Sixteen 1949-46	A	Arc	5	C90	3½	GX140	1¾
8 h.p. 1947-46	A	A	2½	C90	1¾	GX140	1¾
10 h.p. 1947-46	A	A	3½	C90	1¾	GX140	2¾
12 h.p. 1947-46	A	A	4	C90	3½	GX140	1¾
B							
BENTLEY 4½ Litre 1955-52	A	Arc	8	GX90	6	GX90	1¾
Automatic Transmission	—	—	—	MF200	20	—	—
4¼ Litre 1951-46	Arc	Arc	8	GX90	6	GX90	1¾
BOND (†Petroil Sys. ⅝ pts. per gln.)	*TS	*TS	†	C140	¾	—	—
BORGWARD—							
Hansa 2400 (Normal G. Box) 1955-53	Arc	Arc	4½	GX90	1¼	GX90	8½
Hansa 1800 (Normal G. Box) 1955-52	Arc	Arc	4	GX90	1¼	GX90	3¼
BRISTOL 2 Litre 404 1954, 403 1953	A	Arc	6	C90	2½	GX140	3
2 Litre 1953-46	A	Arc	4¼	BB	2½	GX140	3
BUICK 1955 Series 40	Arc	Arc	5	GX90	1½	GX90	3¾
1955-54 Series 50	Arc	Arc	5	GX90	2	GX90	3¾
1954 Series 40	Arc	Arc	5	GX90	1⅛	GX90	3¼
Super 50 1953	Arc	Arc	5	GX90	1⅛	GX90	3¼
Special 40, 1953	Arc	Arc	4½	GX90	1⅛	GX90	3¼
Series 40, 50 1952	Arc	Arc	4½	GX90	1⅛	GX90	3¼
Series 40, 50 1951-49	Arc	Arc	4½	GX90	1⅛	GX90	3¼
Dynaflow Transmission 1954-53	—	—	—	MF200	16½	—	—
Dynaflow Transmission, Others	—	—	—	MF200	14¼	—	—
1948-46 Series 40, 50	Arc	Arc	4½	GX90	1⅛	GX90	3¼
C							
CADILLAC 1955-54 with Hydra. Trans.	Arc	Arc	4	MF200	16½	GX90	4¼
1953-51 with Hydra. Transmission	Arc	Arc	4	MF200	18	GX90	4¼
1950-49	Arc	Arc	4	GX90	2½	GX90	4¼
1948-46	Arc	Arc	6	GX90	2½	GX90	4¼
Hydra-Matic Transmission	—	—	—	MF200	18	—	—

CARS	Engine			Gear Box		Rear Axle	
	Sum.	Win.	Qts.	Grade	Pints	Grade	Pints
CHEVROLET 1955	Arc	Arc	4	GX90	1¼	GX90	1¾
1954-46	Arc	Arc	4	GX90	1½	GX90	3
Powerglide Transmission 1954	—	—	—	MF200	8½	—	—
Powerglide Transmission 1953-50	—	—	—	MF200	15	—	—
CHRYSLER Windsor V8 1955	A	A	4	GX90	2¼	GX90	2¾
Powerflite Transmission 1955	—	—	—	MF200	16½	—	—
Six 1954-46	A	A	4	GX90	2¼	GX90	2¾
Powerflite Transmission 1954	—	—	—	MF200	20	—	—
Semi-Automatic Transmission	—	—	—	MF200	2½	—	—
Torque Converter	—	—	—	MF200	17½	—	—
CITROEN—							
Big 15 1955-53, Light 15 1955-46	A	Arc	4	GX90	3	—	—
6 Cylinder 1955-49	A	Arc	6½	GX90	5	—	—
2 CV 1955-54	Arc	Arc	3½	GX90	2	—	—
D							
D.K.W. (†Petroil Sys. ⅛ pt. per gln.)	BB	BB	†	MG3L	2	—	—
DAIMLER— 3½ Litre Regency Mark II and Sportsman 1955	A	A	5¾	A	4	GX90	3
Conquest 1955-53, Century 1955-54	A	A	4½	A	5½	GX90	2½
5½ Litre 1954-46	A	A	13	A	8	GX90	6
3 Litre Regency 1953-52	A	A	6¾	A	5	GX90	3
2½ Litre Consort 1953-51	A	A	5½	A	5	GX90	3
2½ Litre Other Models 1952-46	A	A	5½	A	5	C140	4
Twenty-Seven 1950-46	A	A	8¾	A	8	GX90	6
DE SOTO Eight 1955-52	A	A	4	GX90	2¼	GX90	3
Six 1955-46	A	A	4	GX90	2¼	GX90	2¾
Overdrive	—	—	—	GX90	3	—	—
Powerflite Transmission	—	—	—	MF200	15½	—	—
Semi-Automatic Transmission	—	—	—	MF200	2½	—	—
Torque Converter	—	—	—	MF200	17½	—	—
DELAHAYE 135, 148	A	Arc	6	GX140	3½	GX90	4½
175, 178, 180	A	Arc	6	GX140	3½	GX90	3
Cotal Gear Box	—	—	—	C90	1¼	—	—
DODGE 1955-46 Conventional Gear Box	A	A	4	GX90	2¼	GX90	2¾
Powerflite Transmission	—	—	—	MF200	15½	—	—
Semi-Automatic Transmission	—	—	—	MF200	2½	—	—
F							
FIAT 1900 1955-53	A	Arc	4½	GX90	2¼	GX90	2
Hydraulic Coupling	—	—	—	MF200	5	—	—
1400 1955-50	A	Arc	4¼	GX90	2¼	GX90	2
1100 Series 1955-53	A	Arc	2½	GX90	2	GX90	1
600 1955	A	Arc	2¼	GX90	2½	—	—
500 C 1955-50	A	Arc	2	GX90	1½	GX90	1¼
500 A and B 1949-46	AF	Arc	2	C140	1½	C140	1¼
1100 Series 1953-46	AF	Arc	2½	GX90	2	GX90	1½
1500 Series 1950-46	AF	Arc	3	C140	2	C140	1¾
FORD V8 1955-53	Arc	Arc	3½	GX90	2¼	GX90	3
V8 1952-50	Arc	Arc	3½	GX90	3	GX90	3
V8 1949	Arc	Arc	3½	GX90	3¼	GX90	3
V8 1948-46	A	Arc	3½	GX90	2½	GX140	2
Zephyr 1955-51, Zodiac 1955-54	Arc	Arc	4	GX90	2¼	GX90	2½
Consul 1955-51	Arc	Arc	3½	GX90	2¼	GX90	2½
Pilot 1950-48	A	Arc	3½	GX90	2	GX140	2
Anglia, Prefect 1955-54	Arc	Arc	2¼	GX90	1¾	GX90	1
Anglia, Prefect 1953-46	A	Arc	2¼	GX90	1	GX140	1
FRASER 1953-47	Arc	Arc	4	GX90	2	GX90	2½
Overdrive Gear Box	—	—	—	GX90	3	—	—
Hydra-Matic Transmission	—	—	—	MF200	18	—	—

MOBILOIL CHART OF RECOMMENDATIONS

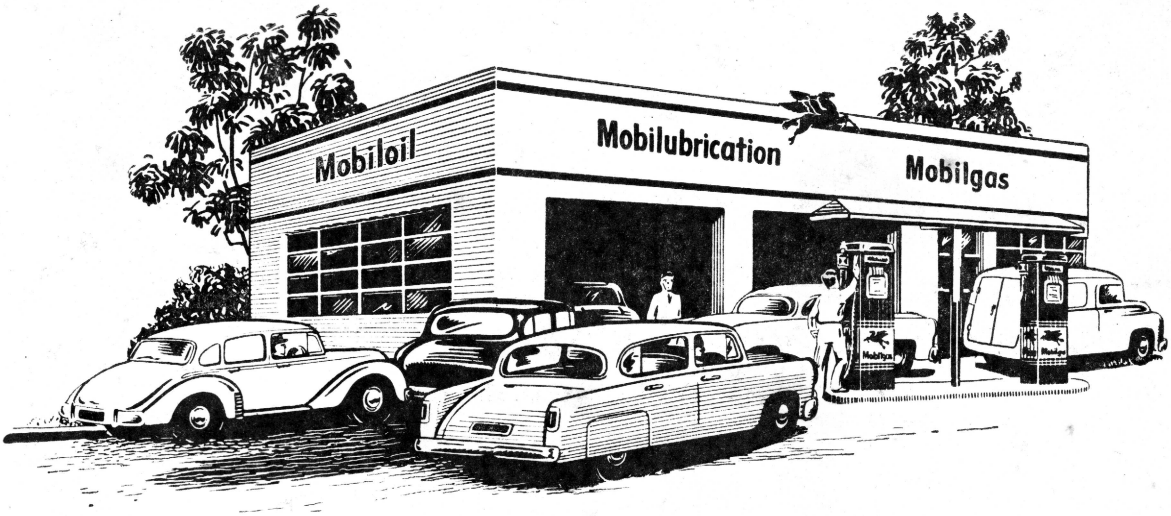
G-H							
GOLIATH GP 700 (Fuel Injection)	*TS	TS	2	C90	2	—	—
H.R.G. 1500 1955-46	A	A	5½	A	2	GX140	3
1100 1953-46	A	A	3½	A	2	GX140	3
HARTNETT	AF	A	2½	GX90	1¾	—	—
HEALEY Austin-Healey 1955-53	A	Arc	6	A	3	GX140	2¼
3 Litre 1953-52	Arc	Arc	6	A	3	GX90	3¼
2.4 Litre 1953-46	A	A	7	GX140	2	GX140	5
Nash-Healey 1953-51	Arc	Arc	5	C90	3	GX140	3¼
HILLMAN—							
Mk. VIII Minx & Californian 1955 ohv	A	Arc	4	A	2½	GX140	1¾
Huskey 1955	A	Arc	3½	A	1¾	GX140	1¾
Estate Car 1955	A	Arc	3½	A	2¼	GX140	1¾
Minx 1954-48, Special 1955 and Californian 1954	A	Arc	3½	A	2	GX140	1¾
Minx 1948-46	A	Arc	3½	BB	2	GX140	1¾
HOLDEN 1955-49	Arc	Arc	3	GX90	1¾	GX90	2¼
HUDSON 1954	Arc	Arc	5¾	GX90	1¾	GX90	2½
1953-48	Arc	Arc	5¾	GX90	1¾	GX90	3
Six 1947-46	Arc	Arc	3¾	GX90	1¾	GX90	2¼
Eight 1947-46	Arc	Arc	5¾	GX90	1¾	GX90	2¼
Hydra-Matic Transmission	—	—	—	MF200	18	—	—
Overdrive	—	—	—	GX90	2¾	—	—
HUMBER Super Snipe, Pullman 1955-53	A	Arc	7½	A	5	GX90	4
Super Snipe, Pullman 1952-48	A	Arc	7	A	5	GX140	4
Hawk Mark VI 1955-54	A	Arc	5¼	A	2	GX90	1¾
Hawk 1954-49	A	Arc	5	A	2	GX90	1¾
Hawk Mark II 1948	A	Arc	5	A	2	GX140	4
14 h.p. Hawk 1948-46	A	Arc	5	BB	2	GX140	4
Snipe, Super Snipe, Pullman 1948-46	A	Arc	7	BB	5	GX140	4
J							
JAGUAR—							
Mark VII M Type and XK 140 1955	A	Arc	9½	A	2½	GX90	3½
3½ Litre Mark VII 1954-51	A	Arc	10½	A	2½	GX90	3½
XK 120 Sports 1954-49	A	Arc	10½	A	2½	GX90	3½
2½ and 3½ Litre Mark V 1951-49	A	Arc	10	A	2½	GX90	3½
Automatic Transmission	—	—	—	MF200	15	—	—
Overdrive	—	—	—	A	4	—	—
2½ and 3½ Litre 1948-46	A	Arc	10	A	2	GX90	2
1½ Litre 1948-46	A	Arc	6	A	2	GX90	2
JENSEN Interceptor 1955-50	A	Arc	7½	BB	4	GX90	4
4 Litre 1952-51	A	Arc	7½	BB	4	GX90	4
Straight Eight 1949-47	A	Arc	7	BB	3½	C140	3½
JOWETT Javelin 1953	A	A	5	A	1	GX90	2
Javelin 1952-48	A	A	4½	A	1	GX90	2
Jupiter 1954-50	A	A	5	A	1	GX90	2
K							
KAISER 1953-51	Arc	Arc	4	GX90	2	GX90	3
Hydra-Matic	—	—	—	MF200	18	—	—
1950-47	Arc	Arc	4	GX90	2	GX90	2½
Overdrive	—	—	—	GX90	3	—	—
L							
LAGONDA 3 Litre 1955-54	A	Arc	7½	C90	3	GX90	2
2½ Litre 1953-47 Syn. Gear Box	A	Arc	7½	A	3	GX90	2
Cotal Gear Box	—	—	—	Arc	3½	—	—
12 Cylinder 1946	D	AF	12	D	4½	GX90	3
LANCHESTER Leda, Fourteen 1953-51	A	A	4¾	A	5½	GX90	2½
Ten 1951-46	A	A	4	A	4	GX140	3
LANCIA Aurelia 2a Series 1955-54	A	A	4	—	—	GX140	6
Aurelia 1954-50, Aurelia GT. 2500	A	Arc	3½	—	—	GX90	6
Appia 1954-53	A	Arc	3	GX90	2¼	GX140	2¾
Aprilia 1950-46	A	Arc	3¾	GX90	1½	GX140	2
Ardea 1953-46	A	Arc	2¾	GX90	1¾	GX140	2¾
LAND ROVER—	A	Arc	5	D	2¾	GX90	3
Transfer Gear Box, Front Axle	—	—	—	D	4	GX90	3
LEA FRANCIS Fourteen 1955-50	A	Arc	4¼	GX90	3½	GX90	3
18 h.p. 2½ Litre 1955-50	A	Arc	6¼	GX90	3½	GX90	3
12 h.p., 14 h.p. 1949-46	A	Arc	5	BB	3½	GX140	3
LINCOLN 1955 Turbo-Drive	Arc	Arc	4	MF200	16½	GX90	3¼
1954-52 Hydra-Matic	Arc	Arc	4	MF200	18	GX90	3¼
1951-50 Hydra-Matic	Arc	Arc	5	MF200	18	GX90	3¼
1950-49 Conventional Gear Box	Arc	Arc	5	GX90	3	GX90	3¼
Overdrive	—	—	—	GX90	3	—	—
1948-46	A	A	4	GX90	2¼	GX90	3¼
M							
M.G. 1½ Litre Magnette 1955-54	A	Arc	3½	A	4	GX90	2½
Midget TF 1955-54	A	Arc	5¼	GX90	1¼	GX90	2¼
TD 1953-50	A	Arc	4½	GX90	1¼	GX90	2¼
1¼ Litre Series YB 1953	A	Arc	4½	GX140	1½	GX90	2¼
1¼ Litre Series YA 1952-48	A	Arc	4½	GX140	1½	GX140	1½
Midget TC 1950-46	A	Arc	4½	GX140	1½	GX140	2
MERCEDES BENZ 300-1955-51	Arc	Arc	5½	MF200	2½	GX90	5½
220 1955-51	Arc	Arc	5¼	MF200	2½	GX90	4½
180 and 180 D 1955-54	A	Arc	4	MF200	2½	GX90	3
170 S-V, 170 S-D 1954 and 170 DS 1953-52	A	Arc	4	MF200	2½	GX90	4½
170 Da 1953-52	A	Arc	4	C90	2½	GX90	4½
170 Va and S 1952-50	A	Arc	4	C90	2½	C90	4
With Hypoid Rear Axle	—	—	—	—	—	GX90	4
MERCURY 1955	Arc	Arc	4	GX90	3	GX90	3
Merc-O-Matic Transmission	—	—	—	MF200	17½	—	—
1954-52	Arc	Arc	3¼	GX90	2½	GX90	3
1951	Arc	Arc	4	GX90	3¼	GX90	3
Overdrive	—	—	—	GX90	3¾	—	—
Merc-O-Matic Transmission	—	—	—	MF200	16	—	—
1950-49	Arc	Arc	4	GX90	3	GX90	2½
Overdrive	—	—	—	GX90	3	—	—
1948-46	A	A	4	GX90	2¼	GX140	2
MORGAN Plus Four 1955-51	A	Arc	5½	A	2½	GX90	2½
4-4 Model 1950-46	A	Arc	5½	BB	2	C140	2
Model F 3-Wheeler 1952-46	A	Arc	2	C140	2½	—	—
MORRIS Minor Ser. II O.H.V. 1955-53	A	Arc	3	A	2¼	GX90	1½
Minor Series MM 1953-49	A	Arc	3¼	GX90	1½	GX90	1½
Oxford Series II 1955-54 and Cowley 1955-54	A	Arc	3½	A	4	GX90	2¾
Oxford 1954-49	A	Arc	4½	GX90	2	GX90	2
Six 1955-49	A	Arc	5	GX90	2	GX90	2½
8 h.p. Series E 1948-46	A	Arc	3¼	GX140	1½	GX140	1
10/4 Series M 1948-46	A	Arc	4	GX140	1¼	GX140	1½
N							
NASH Statesman 1954-53	Arc	Arc	3¼	GX90	2	GX90	2½
Statesman 1952-51	Arc	Arc	4	GX90	2	GX90	2½
Overdrive	—	—	—	GX90	3	—	—
Hydra-Matic Transmission	—	—	—	MF200	18	—	—
Statesman 6 1950; 600 1949	Arc	Arc	4	GX90	2	GX90	2½
Overdrive	—	—	—	GX90	3	—	—
Ambassador Six 1948-46	Arc	Arc	5	GX90	3¼	GX90	3¼
Overdrive	—	—	—	GX90	5	—	—
600 1948-46	Arc	Arc	4	GX90	2	GX90	2½
Overdrive	—	—	—	GX90	3½	—	—
O-P							
OLDSMOBILE Eight 1955-54	Arc	Arc	4	GX90	1¾	GX90	4
Eight 1953-51	Arc	Arc	4	GX90	1¾	GX90	3
Six 1950-49	Arc	Arc	4	GX90	1¾	GX90	3
Eight 1950-49	Arc	Arc	4	GX90	2¼	GX90	3
Six 1948-46	Arc	Arc	4	GX90	1¾	GX90	2
Eight 1948-46	Arc	Arc	5	GX90	1¾	GX90	2

MOBILOIL CHART OF RECOMMENDATIONS

CARS	Engine			Gear Box		Rear Axle	
	Sum.	Win.	Qts.	Grade	Pints	Grade	Pints
OLDSMOBILE (continued)—							
Hydra-Matic Transmission 1953-46	—	—	—	MF200	17½	—	—
Hydra-Matic Transmission 1954	—	—	—	MF200	14	—	—
Hydra-Matic Transmission 1955	—	—	—	MF200	16	—	—
PACKARD 1954-50	Arc	Arc	6	GX90	1⅞	GX90	3½
Custom 8 1950-49	Arc	Arc	6	GX90	1⅞	GX90	5
8 and Super 8 1949-48	Arc	Arc	6	GX90	1⅞	GX90	3½
Ultra-Matic Transmission	—	—	—	MF200	20	—	—
Custom 8 1948	Arc	Arc	6	GX90	1⅞	GX90	5
Six 1947	A	A	4	GX90	1⅞	GX90	3½
Eight 1947	A	A	4½	GX90	1⅞	GX90	3½
Super and Custom Super 8 1947	A	A	5¾	GX90	1⅞	GX90	5
Clipper Super 8 1946	A	A	6	GX90	1⅞	GX90	5¾
Clipper 8 1946	A	A	4½	GX90	1⅞	GX90	3½
Six 1946	A	A	4	GX90	1¾	GX90	3½
Overdrive	—	—	—	GX90	2¾	—	—
PEUGEOT 203C 1955	AF	Arc	3½	AF	2½	GX90	2½
203 1954-49	AF	Arc	3½	AF	2	GX90	2
202	A	Arc	3½	GX90	1	GX90	2
PLYMOUTH 1955-46	A	A	4	GX90	2½	GX90	2¾
Overdrive	—	—	—	GX90	2½	—	—
Powerflite Transmission	—	—	—	MF200	15½	—	—
PONTIAC V8 1955; 6 1954-46	Arc	Arc	4	GX90	1½	GX90	2¾
Hydra-Matic Transmission	—	—	—	MF200	18	—	—
R							
RENAULT Fregate 1955	A	Arc	3½	GX90	1	GX90	1½
Fregate 1954-53	A	Arc	3½	GX90	1	GX90	1
750, 760 1955-49 Rear Engine	A	Arc	1¾	GX90	1¾	—	—
RILEY 2½ Litre Pathfinder 1955-54	A	Arc	6½	GX90	2½	GX90	3
2½ Litre 1953 (late)	A	Arc	7	GX90	2½	GX90	2½
2½ Litre 1953 (early)	A	Arc	7	GX140	2	GX90	2½
2½ Litre 1952-46	A	Arc	7	GX140	2	GX140	4
1½ Litre 1955-53 (late)	A	Arc	5	GX90	2	GX90	2½
1½ Litre 1953 (early)-46	A	Arc	5	GX140	2	GX140	2¾
ROLLS ROYCE—							
Silver Wraith, Silver Dawn 1955-46	Arc	Arc	8	GX90	6	GX90	1¾
Automatic Transmission	—	—	—	MF200	20	—	—
ROVER "90" 1955-54; "75" 1955-50	A	Arc	7½	Arc	3½	GX90	3
"75" 1949-48	A	Arc	7¾	D	4	GX90	3
"60" 1955-54	A	Arc	5	Arc	3½	GX90	3
"60" 1949-48	A	Arc	5	D	4	GX90	3
Ten, Twelve 1947-46	A	Arc	4	D	3	D	2½
Fourteen, Sixteen, Twenty 1947-46	A	Arc	6½	D	3	D	2½
S							
SIMCA Aronde 1955-50	AF	Arc	4½	GX90	1⅞	GX90	1½
8, 8-1200 1953-50	AF	Arc	2½	C90	1⅞	C90	1½
5, 6 1953-50	AF	Arc	1⅞	C90	1⅞	C90	1¼
SINGER Hunter 1955, SM 1500 1954-49	A	Arc	3⅞	BB	3	GX90	2½
SM Tourer (4AD) 1955-52	A	Arc	3¾	BB	2	GX90	2
4AB 1952	A	Arc	3½	BB	2	GX90	2
Nine 1952-46 with 3-Speed Gear Box	A	Arc	3½	BB	2	GX140	2
Nine 1952-46 with 4-Speed Gear Box	A	Arc	3½	BB	2¾	GX140	2
Twelve 1948-46	A	Arc	5½	BB	2¾	GX140	5
Ten 1948-46	A	Arc	3½	BB	2¾	GX140	2
SKODA 1200 1955-53	Arc	Arc	3	GX140	1½	GX140	1½
1102, 1101 1952-49	Arc	Arc	3	GX140	1½	GX140	1½
STANDARD—							
Vanguard 1955-48 (Gasoline)	A	Arc	5½	AF	1½	GX90	2
Vanguard 1955-54 Diesel	A	Arc	6	AF	1½	GX90	2
With Overdrive	—	—	—	AF	3½	—	—

CARS	Engine			Gear Box		Rear Axle	
	Sum.	Win.	Qts.	Grade	Pints	Grade	Pints
STANDARD (continued)—							
8 h.p. 1955-53, 10 h.p. 1955-54	A	Arc	3¼	AF	1½	GX90	1½
8 h.p. 1948-47	A	Arc	3¾	BB	2	GX140	1¾
12 h.p., 14 h.p. 1948-46	A	Arc	7	BB	2	GX140	2
STUDEBAKER Champion 1955-51	A	Arc	4	GX90	1¼	GX90	2
Overdrive	—	—	—	GX90	2¼	—	—
Automatic Transmission	—	—	—	MF200	16	—	—
Champion 6 1950-47	A	A	4	GX90	1¼	GX90	2
Overdrive	—	—	—	GX90	2	—	—
Champion 1946	A	A	4	GX90	3	GX90	2
Overdrive	—	—	—	GX90	2¾	—	—
SUNBEAM TALBOT— Sunbeam Mk. III and Alpine Mk. III 1955	A	Arc	5¼	A	2½	GX90	1¾
Overdrive	—	—	—	A	4½	—	—
Alpine Sports 1954-53; 90 1954-51	A	Arc	5¼	A	2	GX90	1¾
90 1950-49	A	Arc	5¼	A	2	GX140	1
80 1950-49	A	Arc	3½	A	2	GX140	1
Ten 1948-46	A	Arc	3½	BB	2	GX140	1¾
Two Litre 1948-46	A	Arc	5	BB	2	GX140	1
T-V							
TATRAPLAN 1955-49 Rear Engine	A	A	4½	GX140	7	—	—
TRIUMPH— 2 Litre Sports TR 2 1955-53	A	Arc	5½	AF	1½	GX90	1½
With Overdrive	—	—	—	AF	2¾	—	—
Mayflower 1953-52	A	Arc	3	AF	1¼	GX90	1¼
Mayflower 1951	A	Arc	3	AF	1¼	GX90	1¼
2.1 Litre Renown 1955-49	A	Arc	5½	AF	1½	GX90	2
2.1 Litre Roadster 1952-49	A	Arc	5½	AF	1½	GX90	2
With Overdrive	—	—	—	AF	3½	—	—
1800 1949-46	A	Arc	7	BB	2	GX140	2¾
VAUXHALL— Velox Series EIP 23 h.p. 1955-53; and Cresta 1955	Arc	Arc	4½	C90	3	GX90	2½
Series E 18 h.p. 1952	Arc	Arc	4	C90	3	GX90	2½
Wyvern Series EIX 16 h.p. 1955-53	Arc	Arc	3¾	C90	3	GX90	2½
Wyvern Series E 12 h.p. 1952	Arc	Arc	2¾	C90	3	GX90	2½
Velox 1951-49	Arc	Arc	4½	C90	1½	GX140	3½
Wyvern 1951-49	Arc	Arc	2¾	C90	1½	GX140	3
Fourteen 1948-46	Arc	Arc	4½	C90	1½	GX140	2½
Ten, Twelve 1948-46	Arc	Arc	2¾	C90	1	GX140	2
VOLKSWAGEN	Arc	Arc	2½	C90	3½	—	—
W							
WILLYS 6-85 1955-53	Arc	Arc	4½	GX90	1½	GX90	2
Station Waggon 4-73 1953-50	Arc	Arc	3½	GX90	5½	GX90	2½
Front Axle Differential	—	—	—	—	—	GX90	2
Universal Jeep 1952-49	Arc	Arc	4	GX90	5½	GX90	2½
Front Axle Differential	—	—	—	—	—	GX90	2
Universal Jeep 1948-47	Arc	Arc	3½	GX90	5½	GX90	2½
Jeep Transfer Case	—	—	—	GX90	—	—	—
Station Waggon 4-63 1948-47	Arc	Arc	3½	GX90	1¼	GX90	1¾
Station Waggon 6-63 1948	Arc	Arc	4	GX90	1½	GX90	1¾
Overdrive	—	—	—	GX90	2½	—	—
Universal Jeep 1946	Arc	Arc	3½	GX90	2½	GX90	2
Overdrive	—	—	—	GX90	1¾	—	—
WOLSELEY Four Forty-Four 1955-53	A	Arc	4½	GX90	1¾	GX90	1¾
Four Fifty 1953-49	A	Arc	3½	GX90	1¾	GX90	1¾
Six Eighty 1955-49	A	Arc	5	GX90	2½	GX90	2½
8 h.p. 1948-46	A	Arc	3½	GX140	1½	GX140	1¼
10 h.p. 1948-46	A	Arc	3½	GX140	1½	GX140	1¼
25 h.p. 1948	A	Arc	8½	GX140	2½	GX140	3
12/48, 14/60, 18/85 1948-46	A	Arc	4¾	GX140	1¾	GX140	3

*Alternative Recommendation, MOBILOIL A.



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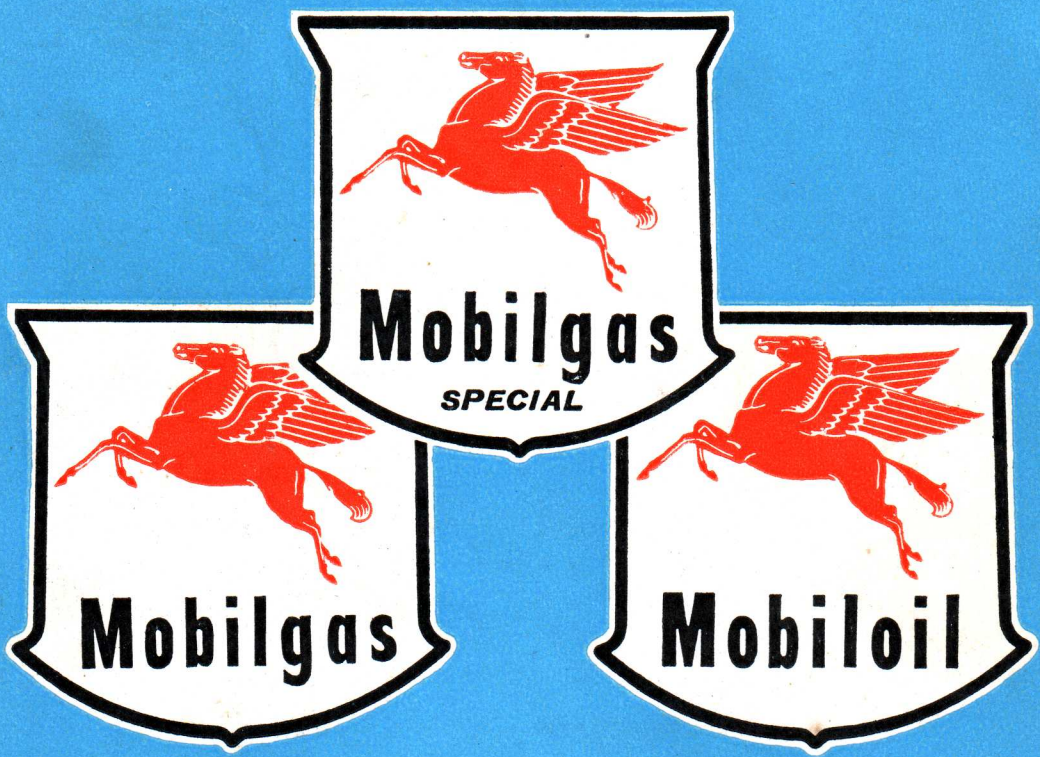
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